Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted
Site Wide Safety and Health Plan (Rev 5) with revised IH plan

Date submitted
10/14/2010

Submitted to whom
Craig Zeller, EPA

Concurrence

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Approvals

TVA _____ Date 10/14/10

EPA _____ Date 10/21/10

APPROVALS

By their signature, the undersigned hereby certify that this Site Wide Safety and Health Plan has been reviewed and approved for use at TVA's Kingston Ash Recovery Project in Kingston, Tennessee.

Craig Zeller
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Revision 05

SITE WIDE SAFETY AND HEALTH PLAN

FOR THE

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

Prepared for:

Tennessee Valley Authority

Prepared by:

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October 2010

Summary of Changes
Site Wide Safety and Health Plan Revision 04 to Revision 05

Section	Changes
Title Page	Changed Revision 04 to Revision 05
Title Page	Changed date from February 2010 to August 2010
Signature Page	Changed from Michael Scott to Kathryn Nash Changed from Sean Healey to Danny Whitaker-Sheppard
1.1 Background	Paragraph 3, line 3 – added “applicable sections of” Paragraph 3, line 4 – removed “(as applicable)”
1.2 Activities	Line 5 – removed “and” Line 6 – added “and 6) cell closure activities including deep soil mixing, ash hauling, ash stacking and capping.”
1.2.2 Ash Processing and Load Out	Line 3 – added “(Rim Ditch)” Line 4 – removed “ash disposal channel” and added “rim ditch” Line 7 – added “or with clam shell buckets or drag lines,”
1.2.3 Infrastructure and Support Activities	Added at the end of the paragraph – “Environmental sampling activities will occur on and off site involving air, water, soil, flora and fauna. These activities will at times occur on the Emory and Clinch Rivers.”
1.2.4 Environmental Sampling	Removed entire section
1.2.5 Dike Construction	Changed to 1.2.4
1.2.6 Recovery Activities	Changed to 1.2.5
1.2.6 Cell Closure Activities	Added this section
1.3 Summary of Major Hazards	Added line 3
3.2 Background and Site Description	Removed last paragraph.
4.4.3 Heat Stress	Line 4 – removed “TVA those” and added values
4.4.5 Noise	Paragraph 5 – added to last sentence “and TVA Safety Procedure #310 Hearing Conservation Program. Use of double hearing protection is required at sound levels >96dBA.”
4.4.71 Underground Utilities/Excavation Clearance and Permitting	Paragraph 2 – added after first sentence “Depending on the location of the excavation, an Ash Recovery Site permit may be developed (reference SOP-HSE_014 Excavation and Trenching from the Kingston Ash Recovery Project Management Plan). If a plant permit is required, complete…”

Section	Changes
4.4.19 Eye, Face, and Hand	Removed the “In addition, protection such as face shields or welding helmets shall be worn in addition to safety glasses” from the first part of the third sentence and added at the end “protection such as face shields or welding helmets shall be worn in addition to safety glasses.”
4.4.20 Fly Ash Hazards	Added entire section
4.5 Chemical Hazards	Second paragraph – after hydraulic fluids, added “water treatment chemicals such as flocculating agents used in the dredging operations and acetic acid for ph control,”
4.5.3 Water Treatment Chemicals	Added entire section
Table 4-1	Added table
4.6.2 Insects	At the end of paragraph – added “For significant infestations, a licensed exterminator has been contracted to assist in removal. Contact the TVA Kingston Ash Recovery facilities manager for assistance.”
Section 5.1.1 Integrated Air Sampling	First paragraph, added “Lead Industrial Hygiene Technologist (LIHT) and removed health and safety technician” Second paragraph, added at the end of the paragraph “Please see Appendix K for full details of the IH Monitoring Plan.”
Section 5.3 Heat Stress Monitoring	At the end of the paragraph, added “confined spaces, etc.) As a minimum, each contractor on site shall provide, if work scope warrants, a qualified person able to count and record pulses/minute and read and record body temperatures as a means to fully implement the personal physiological monitoring.”
Section 5.3.2 Personal Monitoring	Added paragraph 8
8.1 Basic Work Practices	At sixth bullet – removed “smoke” and added “use tobacco products (smoking, dipping, chewing)” At sixth bullet, sub-bullet 1 – removed “smoking is” and added “tobacco use are”
8.2.1 General Cleaning Requirements	Paragraph 1 – removed “smoking” and added “using tobacco products (smoking, dipping, chewing)”
8.3 Equipment Decontamination	Paragraph 2 – added guidelines
10.0 Emergency Response Plan	Paragraph 5 – removed “Appendix F, FII – Emergency Phone Tree” and added “Table 15-1 under Section 15.4.2”
10.2.1 EMS Site Access and Initial Response	Added medical emergency response steps

Section	Changes
10.3 Hazardous Material / Environmental Release	Paragraph 3 – removed “Figure FII – Emergency Phone Tree and can be found in Appendix F” and added “Table 15-1 under Section 15.4.2”
10.6 Natural Disasters / Tornados	Paragraph 1 – changed Figure “V” to “VIa” and add “and Figure VIb” Added paragraph 2 through 8 Added “Shelter locations at the north end of project” and Shelter location south end of the project” and section indicating where employees drive and park and how many each stack will accommodate.
11.2 Site-Specific Training / Orientation	Paragraph 1 – Added the last sentence.
15.2 Weekly Safety Reports	Paragraph 1 – Removed “a coversheet which can be used is provided in Appendix D”
15.4.1 Incident Definition	Added bullet 5
15.4.2 Verbal Notifications	Removed “Supervisors” and added “Individuals”
16.0 References	Added OSHA website
Appendix K	Added Industrial Hygiene (IH) Monitoring Plan

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LIST OF APPENDICES

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
AHA	Activity Hazard Analysis
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BBP	Bloodborne Pathogens
CAS#	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
dBA	Decibels A Weighted
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESH	Environmental, Safety, and Health (Reference HSE)
EZ	Exclusion Zone
GFCI	Ground Fault Circuit Interrupter
GM	General Manager
HAZCOM	Hazard Communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	Hepatitis B Virus
HIV	Human Immunodeficiency Virus
HSE	Health, Safety, and Environmental
HSEP	Health Safety and Environmental Procedure
JSA	Job Safety Analysis
KIF	Kingston Fossil Plant
LIHT	Lead Industrial Hygiene Technologist
LOTO	Lock Out Tag Out
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanic Atmospheric Association
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration/Act
PEL	Permissible Exposure Limit
PER	Problem Evaluation Report

PFD	Personal Floatation Device
PHSM	Project Health and Safety Manager
PM	Program Manager
PPE	Personal Protective Equipment
REL	Recommended Exposure Limit
SOP	Standard Operating Procedure
SSHO	Site Safety and Health Officer
SWSHP	Site Wide Safety and Health Plan
SZ	Support Zone
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
TVAP	Tennessee Valley Authority Police
TWA	Time Weighted Average
USCG	United States Coast Guard
WBGT	Wet Bulb Globe Thermometer
WEP	Water Extraction Points

APPROVALS

By their signature, the undersigned hereby certify that this Site Wide Safety and Health Plan has been reviewed and approved for use at TVA's Kingston Ash Recovery Project in Kingston, Tennessee.

Craig Zeller Remedial Project Manager EPA	Date
Steve McCracken General Manager TVA	Date
Kathryn Nash Program Manager TVA	Date
Charles Proffitt TVA Senior Manager Safety FGD&C	Date
Jack Howard Program Manager Jacobs	Date
Danny Whitaker-Sheppard Safety and Health Manager Jacobs	Date

1.0 INTRODUCTION

1.1 BACKGROUND

This Site Wide Safety and Health Plan (SWSHP) addresses the safety and health management and practices for the Tennessee Valley Authority's (TVA) Kingston Fossil Plant Ash Release Response Project.

This revision as well as subsequent revisions of the SWSHP incorporates the specific requirements of 29 Code of Federal Regulations (CFR) 1910.120; Hazardous Waste Operations and Emergency Response (HAZWOPER). Plans written prior to this revision were not required to address the HAZWOPER requirements; however they were adequately protective of employee safety and health. The major changes in this and future revisions primarily address terminology, work zones, worker training and medical monitoring requirements as required by HAZWOPER.

This SWSHP addresses the identified hazards and presents procedures to be followed by site personnel to protect their health and safety. Activities performed under this SWSHP will comply with applicable sections of Occupational Safety and Health Administration (OSHA) Regulations 29 Code Parts 1910 and 1926, U.S. Army Corps of Engineers EM385 and the TVA Safety Program. Appendix A contains a list of programs, procedures, and guidelines that will be applicable on this project; electronic formats, which can be found on the TVA Intranet, ensures currency and consistency of these documents, and are available for examination by project participants if requested.

The SWSHP will be revised periodically as determined by the project team and changes will be communicated to all holders of controlled copies of the SWSHP.

1.2 ACTIVITIES

The components that are covered by this SWSHP are 1) dredging of ash from rivers and auxiliary water bodies; 2) ash processing which will include drying and volume reduction by movement of ash / windrow management, loading of processed ash for transfer to disposal areas; 3) support activities which will include dust control, water management, environmental sampling and site maintenance; 4) dike construction; 5) recovery activities which will include cenosphere collection, debris removal, community outreach and dock reconstruction; and 6) cell closure activities including deep soil mixing, ash hauling, ash stacking, and capping.

1.2.1 Dredging

Dredging, both mechanical and hydraulic, will occur throughout the response project. Mechanical dredging will be used to remove larger debris from the river channels before the hydraulic dredge begins. It may also be used in areas inaccessible to hydraulic dredges. Excavators and cranes fitted with clamshell buckets and draglines will be situated on floating barges. Hydraulic dredges will follow to remove the ash from the river bodies at a prescribed depth. Dredging has been segregated into phases:

- The primary objective of dredging is to clear the Emory River channel to minimize ash migration and the potential for upstream flooding.

- A second priority is to dredge the remaining ash within the river channel and mouth of the embayment while minimizing disturbance of legacy, native sediments.

1.2.2 Ash Processing and Load-Out

Current plans are for the ash processing site to be subdivided into at least two areas. The Ash Recovery Area is located on the east side of the triangle. Dredge slurry will be discharged into an ash disposal channel (Rim Ditch); the slurry will flow at a rate which will allow the solids to fall out where they will be removed from the Rim Ditch using excavators. The material will then be subjected to a drying and volume reduction by windrowing. The water will continue and discharge into the plant Sluice Trench to allow further settling. Solids will be removed from the Sluice Trench in the same manner as the ash disposal channel or with clam shell buckets or drag lines, and will be trucked over to the processing area using articulating dump trucks.

Temporary ash storage areas will be reserved primarily for short term storage and additional drying. From these piles, ash will be loaded into railcars and / or trucks for transport to offsite disposal locations.

1.2.3 Infrastructure and Support Activities

The site facilities, grounds and common use equipment will be constructed and maintained as necessary. Dust control is implemented continuously onsite using water trucks and hydro-seed trucks spraying Flexterra®. The ash will also be re-contoured to limit the chance for dust generation and erosion. Water management includes controlling the flow of surface runoff through the slide area and managing water in the windrow areas. Site maintenance involves site facilities, roads and ancillary facilities. Environmental sampling activities will occur on and off site involving air, water, soil, flora and fauna. These activities occasionally occur on the Emory and Clinch Rivers.

1.2.4 Dike Construction

Dike areas will be reconstructed or strengthened as required onsite. This will primarily involve the placement of materials around existing dike areas.

1.2.5 Recovery Activities

Numerous activities will be conducted on and off the TVA property in areas impacted by the slide. This includes debris removal from rivers, cenosphere collection, and private dock repair / reconstruction. In addition, a portion of the Community Outreach Program will involves activities to respond to complaints and concerns from local residents as well as area enhancements to the surrounding community.

1.2.6 Cell Closure Activities

Activities will include performing deep soil mixing to create a stable foundation for perimeter containment of the land filled ash, ash hauling from areas outside of the planned cell footprint, construction of a working platform, ash stacking to construct the cell, and final capping/closure, including installation of instrumentation for future monitoring.

1.3 SUMMARY OF MAJOR HAZARDS

These activities present the following major hazards.

- Chemical hazards associated with handling fly ash;
- Physical hazards associated with working on or near water;
- Physical hazards associated with working on fly ash;
- Working around heavy equipment, railroad and rail equipment used for materials handling, transfer and movement;
- Operation of watercraft and associated hazards of the marine environment;
- Dredging operations;
- Crane operations;
- Diving operations; and
- Exposure to temperature extremes.

1.4 BEYOND ZERO

Beyond Zero® Performance describes a site approach and establishes expectations for both safety and project execution. We will achieve this level of performance excellence through teamwork and partnering with our client, site contractors and through the participation of every person on this project.

All site personnel are entitled to a safe working environment, individually and collectively; we are responsible for our own safety and that of our fellow employees.

We believe the following:

- All incidents are preventable through proper planning, tasking, and execution of plans as written.
- Any goal less than Zero Incident Performance is unacceptable and sends the message that incidents cannot be prevented.
- Active participation by all personnel is required to achieve Beyond Zero Performance. This includes all site personnel working collectively.
- If any incident does occur, it must be reported and investigated to identify root causes, take corrective actions, and communicate the lessons learned.

Various Beyond Zero® initiatives will be developed and rolled out with support and approval of key site management.

1.5 INITIAL SITE SPECIFIC ORIENTATION

Initial site specific orientation will be conducted per the requirements of 29 CFR 1910.120 (b) (4) (iii). All personnel being provided access to the site to perform work in restricted areas such as Exclusion Zones (EZ) and / or Contamination Reduction Zones (CRZ) will complete a pre-entry orientation. The orientation will address the anticipated site hazards associated with assigned

tasks as well as work methodologies and control measures used to mitigate those hazards. If conditions or procedures change, briefings will be repeated as necessary.

Those workers in offices and Support Zones (SZ) who do not enter controlled areas will be required to attend a site specific health and safety orientation before being allowed unescorted site access. The orientation will focus on the general site layout, locations of restricted / controlled areas, emergency procedures and Environmental, Safety and Health (ESH) program elements.

1.6 SUBCONTRACTOR ADHERENCE POLICY

Jacobs uses a Subcontractor Adherence Policy as described in Jacobs *HSEP 2.9, Subcontractor HSE*. The process, **which only applies to Jacobs subcontractors**, is a tiered approach in maintaining subcontractor safety compliance. Jacobs realizes that not all companies understand the inherent need to operate safely under all conditions or may not be experienced in Jacobs' procedures. The subcontractor shall be mentored through a series of written notifications when health, safety, or environmental discrepancies are noted. Rarely does the policy need to be exercised, however this contract method of compliance is readily available to ensure a safe work site.

By attending site orientation, being trained on the specifics of this plan and in writing agreeing to comply with its requirements, all personnel affirm their belief in and commitment to the Zero Incident Process. The site safety and health professionals will continually evaluate planning and project execution to ensure that safety is embedded in the work process.

All contractors onsite will be required to comply with the requirements of this SWSHP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Project Organization and Responsibilities for each position are enumerated in the Project Management Plan.

TVA is responsible for establishing the goals, policies and requirements for the Kingston Ash Recovery Project Site.

The Construction Manager (CM), in association with the TVA, is responsible for ensuring that those goals, policies, and procedures are made known to all site personnel and are executed.

It is the responsibility of each contractor to ensure that their personnel and subcontractors are made aware of the goals, policies and procedures and that those goals, policies, and procedures are acted upon accordingly.

It is the responsibility of each individual to:

- Report all injuries immediately.
- Comply with applicable safety standards.
- Follow established site and employer safety and health work rules.
- Wear prescribed Personal Protective Equipment (PPE) (hard hats, high visibility vests, safety glasses, hard toed foot wear and gloves as appropriate).
- Promptly report hazards (to either your supervisor or submit a Safety Observation Report [SOR]).
- Participate in the daily pre-task planning.
- Participate in required training.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

This section provides background information for TVA's Kingston Fossil Plant (KIF) and the Emory River.

3.1 LOCATION

The KIF is located on the Emory River arm of Watts Bar Reservoir, which feeds into the Clinch River. The Emory River borders the KIF to the east. The Emory River rises on the Cumberland Plateau in Morgan County, Tennessee and crosses into Roane County near Harriman, Tennessee. Flow on the Emory River in the vicinity of KIF is not controlled upstream by flood control or navigation structures, but the river elevation is controlled by Watts Bar Dam located downstream of KIF.

3.2 BACKGROUND AND SITE DESCRIPTION

On Monday, December 22, 2008, just before 1:00 a.m., a coal fly ash release occurred at the KIF, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River and surrounding land.

Ash, a by-product of a coal-fired power plant, is stored in containment areas. Failure of the Dredge Cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the area contained about 9.4 million cubic yards (cy) of ash. The dike failure released about 5.4 million cy of coal ash that now covers about 300 acres and affected about 40 area homes.

Fly ash filled the Swan Pond Embayment on the north side of the KIF property adjacent to the failed dredge cell. A dike was constructed in the eastern portion of the Swan Pond Embayment to contain that fly ash while a response action plan is developed by TVA and approved by the Tennessee Department of Environment and Conservation (TDEC) and the U.S. Environmental Protection Agency (EPA). Fly ash to the west (formerly upstream) of the Swan Pond dike is contained from further migration toward the Emory River by the dike. Fly ash also entered the channel and overbank areas of the riverine section of the Emory River. TVA is recovering the material outside of the Swan Pond Embayment by use of dredging operations.

3.3 SITE CHARACTERIZATION DATA

The fly ash that was released to the Emory River originates from the coal burned in boilers for power production at KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand. Trace amounts of arsenic, selenium, cadmium, boron, thallium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

3.4 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT ORDER

On May 11, 2009 an order was implemented to apply the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to the response and cleanup actions associated with this program. As such, requirements related to 29 CFR 1910.120, also known as HAZWOPER, will be followed. Health and safety procedures prior to

this order did not specifically incorporate the requirements of HAZWOPER but were found to be adequately protective of worker safety and health. Key changes in this document associated with this order relate primarily to terminology, site control and training requirements which include:

- Training to be conducted per the general requirements of 29 CFR 1910.120 and the specific requirements of 29 CFR 1910.120, sections (e)(3), (e)(4), (e)(5), (e)(6), (e)(8);
- Implementation of a documented supervised field experience duration for all site workers, per the requirements of 20 CFR 1910.120(e)(3)(i) and (ii) typically a 24 hour work period;
- Establishing fencing, barricades and signage around the perimeter of the site stating, “Environmental Clean-up in Progress, Do Not Enter, No Trespassing”;
- Application of 0.050 mg/m^3 as an 8 hour Time Weighted Average (TWA) occupational exposure limit and 0.025 mg/m^3 as the 8 hour TWA action level for crystalline silica (respirable fraction);
    - Measured levels at the action level will initiate increased site control of the associated task area, proper signage at entry points to the work area, increased worker monitoring and additional worker training on control measures;
    - Measured levels at the occupational exposure limit will implement all of the action level requirements, use of Level C PPE by all impacted individuals, personal decontamination and medical surveillance.
    - Exposure limits will be adjusted utilizing the Brief and Scala model if work shifts vary significantly from 8 hour/day, 40 hour/week shifts.
- Increased focus on personal hygiene which includes the deployment of hand washing stations, boot cleaning locations and other decontamination activities as warranted to minimize the dispersion of fly ash to personal vehicles, worker residences and support / office areas.

4.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the overall physical, chemical and biological hazards that may be encountered during the execution of this project. It is expected that these hazards and task specific controls used to minimize their risk will be established in task specific Job Safety Analyses (JSA) which are required for all site tasks.

4.1 TASK HAZARD ANALYSIS

General task hazard analysis for activities expected to occur onsite have been developed and included in Appendix E. The process for developing Activity Hazard Analyses (AHA) and JSAs are further discussed in Section 7.0 of this document. The hazard analyses included in this document are generic in nature and reflect the potential hazards of the site as outlined in this section. However, they must be further developed by task supervisors to address the specific conditions, hazards and those controls expected to be used for their crews.

4.2 ZERO TOLERANCE ISSUES

It should be noted that TVA has the following issues which are considered to be immediately dangerous to life and are “Zero Tolerance”. Per the Zero Tolerance policy, violation will result in a 90 day termination for the first offense with more severe disciplinary action for repeat offenses. These are further discussed within this document where applicable and shall be addressed as appropriate for the task on all JSAs:

- Working at heights greater than 4 feet without proper protective systems or personal fall arrest devices.
- Failure to wear required respiratory protection.
- Employees under the influence of drugs or alcohol.
- Fighting.
- Entering confined spaces without proper permitting, training and equipment.
- Failure to comply fully with hot work permits.
- Riding equipment not designed for transporting employees.
- Unsafe operation of motorized equipment.
- Not properly locking out / tagging out (LO/TO) equipment per *TVA Safety Procedure 615, Lock-out/Tag-out* prior to removing machine guarding or entering areas of operation.
- Failure to wear a life vest when working over, adjacent to (within 6 feet), or in the water.
- Entering a regulated area (asbestos, lead, arsenic, radiation) without authorization.
- Entering unprotected excavations or entering excavations without adequate review and approval of a competent person.

4.3 SITE SPECIFIC PROCEDURES

Numerous site specific procedures have been developed to assist Project Managers (PM), CMs, Superintendents, and Foremen in the ESH aspects of work planning. These documents are located in the *Kingston Ash Recovery Project, Project Management Plan*. They do not

repeat the specific requirements already established in the associated TVA Safety Procedures, however they do detail the methods to be used on this site in applying those requirements. These procedures address responsibilities and basic planning steps to be used for activities associated with the following:

- Interaction with railroad operations
- Equipment and materials for delivery and removal (mobilization / demobilization)
- Float Plan (boating)
- High hazard lifts
- Non-routine site activities (visitors)
- Excavation and trenching
- Hot work
- Working around heavy equipment
- Permitted and high risk activities
- Supplement for man-lift operations
- Site-specific automatic external defibrillator procedure

4.4 PHYSICAL HAZARDS

An evaluation of physical hazards common to the site have been included in this section. This information should be used as a guide in developing JSAs.

4.4.1 Slips, Trips, and Falls

The site includes significant areas of uneven ground, rip-rap, river banks and difficult walking / working surfaces. Considering slips, trips and falls are the most common cause of injury on this type of work site, considerable planning and care must be taken to minimize the likelihood of injury.

4.4.1.1 Slips, Trips, and Same Level Falls

Whenever possible, walking surfaces will be designated and maintained to provide as level as possible of a walking surface. If areas are to be used repeatedly for foot traffic such as access ways to boat ramps, docks, or storage areas, it will be required to designate and maintain proper access to these locations. Special consideration must be given to walkways:

- Used by personnel carrying equipment and materials
- Used routinely for river or boat access
- Used by visitors and office personnel
- Intended to provide emergency egress from high hazard areas
- Routinely used by personnel working night shifts
- Around process equipment and stationary moving machinery

- Where water build-up could create ice in the winter months

In addition to proper walkways, proper field footwear is essential to minimize risk to slips and trips. All field personnel are required to wear steel-toe work boots with adequate ankle support. Steel-toe shoes will not be worn in the field. Office personnel are encouraged to wear footwear that will provide adequate traction on the dirt walkways and wooden stairs in and around the field trailers.

4.4.1.2 Falls from Elevation

Falls from elevation can be mitigated a number of ways including; avoidance, process change, engineered fall protection systems such as standard railings or personal fall arrest systems. All of these approaches require significant advanced planning and coordination with the Project Health and Safety Manager (PHSM) and Site Safety and Health Officer (SSHO). Details of how fall prevention will be implemented must be thoroughly established and all impacted personnel properly instructed prior to the activity taking place.

TVA maintains a Zero Tolerance policy on anyone violating fall prevention / protection requirements. This includes working outside of engineered systems, working at heights greater than 4 feet without personal fall arrest systems or improperly implementing established procedures. Requirements for implementing fall protection systems will be consistent with *TVA Safety Procedure 305, Fall Protection Systems*.

4.4.2 Confined Space Entry

Routine operations do not require entry into permit required confined spaces. On occasion, entry into vessel holds for inspection or repair work is required. These spaces are typically considered permit required confined spaces.

Prior to entering any space with all of the following characteristics, an evaluation must be performed by the contractor SSHO with concurrence by the PHSM as to whether or not permit required confined space procedures are required:

- A space that is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous employee occupancy.

If it is determined that the space meets characteristics of permit required confined spaces, *TVA Safety Procedure 801, Confined Space Entry* must be followed. Basic requirements include worker training, clearance procedures, adequate staffing, means for prompt rescue and appropriate SSHO support.

Gondola railcars have been identified as confined spaces onsite, but do not meet the definition of permit required confined spaces under current operations. If operations change significantly, additional evaluation will be required.

4.4.3 Heat Stress

Heat stress is a significant potential hazard during summer months at the site. A heat stress prevention program will be implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing and for other personnel when the Wet Bulb Globe Temperature (WBGT) index exceeds values established in *TVA Safety Procedure 806, Heat Stress.*

4.4.3.1 Heat Stress Monitoring

Monitoring will consist of either ambient, personal dosimetry or personal physiological techniques. Discussion of these various approaches are established in Section 5.3 of this plan.

Consideration must be given for those workers in areas of increased thermal loading such as working inside rail cars, working on top of black railcar liners and working in extra levels of Personal Protective Equipment (PPE) such as Tyvek.

If conditions warrant, a work rest regimen will be implemented to decrease the risk of personnel developing heat related conditions. Work rest cycles vary based on the results of ambient or personal monitoring, the type of work being performed and the acclimatization level of workers as prescribed in *TVA Safety Procedure 806, Heat Stress*.

4.4.3.2 Heat Stress Conditions

Any individual exhibiting signs of heat stress conditions must be provided appropriate treatment immediately.

The following is a brief description of common heat related ailments and their treatment:

Heat Fatigue – Symptoms of heat fatigue include impaired performance of skilled, sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the stress and insure adequate hydration before a more serious heat-related condition develops. It may be necessary in some cases of heat fatigue to remove the worker from strenuous activity for the entire day since symptoms may return more rapidly and with increased severity when heat exposure continues.

Heat Exhaustion – Symptoms include headache, nausea, vertigo, and weakness. This condition responds readily to prompt treatment such as cooling and rehydration. Workers suffering from heat exhaustion should be removed from the hot environment and provided fluids and adequate rest. Any worker suffering from signs of heat exhaustion must be removed from strenuous work activity for the day.

Heat Stroke – Heat stroke is a MEDICAL EMERGENCY. It occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. The primary signs and symptoms of heat stroke are confusion and irrational behavior, loss of consciousness, convulsions, hot, dry skin and an abnormally high temperature.

Any worker exhibiting heat stroke symptoms should be immediately removed from their protective clothing without regard to chemical decontamination. Medical emergency responders must be called and the worker cooled to the extent possible until emergency response personnel arrive. Workers having suffered this ailment must have medical clearance from a physician prior to returning to work.

4.4.4 Cold Stress

During the colder months of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery walking surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The effects of low temperatures are further exacerbated by the proximity of the river. Discussion of cold stress monitoring is provided in Section 5.4 of this plan.

Adequate plans and procedures must be established to minimize the impact of these potential hazards, including adequate emergency accommodations for workers on water. Protection of workers from cold stress will include additional clothing, warm up periods, etc.

4.4.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Suspected high noise operations will be evaluated to determine if protective measures are warranted.

Worker monitoring for noise exposure is established in section 5 of this document.

Workers with 8-hour TWA exposures exceeding 85 decibels A weighted (dBA) will be included in a Hearing Conservation Program as required by 29 CFR 1910.95 and 1926.52. This is considered the action level for noise exposure. The Permissible Exposure Limit (PEL) for noise in an 8 hour work day is 90 dBA.

For those personnel routinely working 12 hour work days, the action level is 82 dBA, the PEL is 87 dBA.

In some work environments, such as dredge engine rooms, dual hearing protection may be warranted. An evaluation should be made of the adequacy of hearing protection in these locations. This evaluation must follow the procedure established in 29 CFR 1910.95, Appendix B and *TVA Safety Procedure 310, Hearing Conservation Program*. Use of double hearing protection is required at sound levels >96 dBA.

4.4.6 Work On or Around Water

A significant amount of the work on this project will be conducted on or around water. Hazards associated with working around water are unique and are to be included in AHAs. In addition, prior to performing work on the water in boats outside of the immediate dredge areas, a Float Plan (Form 057) in Appendix D must be submitted, tracked and maintained by a dedicated individual on shore.

In preparing the AHAs, consideration will be given to the elements of Jacobs *HSEP 15.3, Work Over Water or Adjacent to Water*, U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, Sections 19 and 30, and any applicable TVA requirements or U.S. Coast Guard (USCG) regulations. For more extensive information on working on or around water, refer to the Marine Operations Requirements (Appendix H).

Unless otherwise posted, Personal Flotation Devices (PFD) will be required when working within 6 feet of the edge of water. If exceptions to this requirement are necessary, they must be

established on the task specific AHA with concurrence from the SSHO. A complete list of Marine Emergency and Rescue Equipment can be found in Appendix F, FVIII – Marine Emergency Equipment.

All groups engaged in diving operations shall as a minimum meet the requirements of 29 CFR 1910 Subpart T Commercial Diving Operations and *TVA Safety Procedure 814, Underwater Diving*. This includes but is not limited to training requirements and the creation of a Dive Plan.

In the event that navigation changes are required in the river, they must be coordinated through the USCG, Nashville.

4.4.7 Utility Clearance

4.4.7.1 Underground Utilities / Excavation Clearance and Permitting

Whenever intrusive activities are conducted whether land or water based, the threat of contact with underground utilities exists, includingelectrical, gas, sewage, etc.

Before the execution of any intrusive activities (or any type of marine activity), the TVA process for obtaining an excavation permit and utility clearance must be completed. Depending on the location of the excavation, a Kingston Ash Recovery Project permit may be developed (reference site-specific Standard Operating Procedure *SOP-HSE-014, Excavation and Trenching* . If a plant permit is required, complete an Excavation Permit found in Appendix D along with the following steps per *TVA Safety Procedure 804, Excavations and Trenching*:

- A plant specific administrative cover page with Part A & B. Part A includes a plant specific sequential number (Plant/EXC/yr/number; e.g. ALF-EXC-0501) and the appropriate reviews for permit approval. Approvals are based on the subject matter expert's safety assessment within their area of expertise of the proposed excavation. Part B includes approvals for completion and final closure of the permit.
- A description of the work to be performed.
- Exact location of the excavation and the embedded systems such as piping, electrical conduit, etc., that are to be located and marked.
- The hold order numbers on systems that have to be de-energized because they are located in or near the excavation.
- Any drawings or sketches needed to locate these embedded systems.

The utility clearance agency will be notified and the utility companies will mark existing utilities. In some instances this may include TVA in-house utility locator service or Tennessee On-Call or both. The clearance reference number will be recorded and kept current.

In the event underground work is required to be performed in the area of known utilities, non-mechanical means must be used to positively identify the location of these utilities prior to heavy equipment being used. A spotter should be positioned to assist the equipment operator avoid utilities during all excavation activities in these areas.

Prior to any workers entering excavations, a designated competent person must perform an excavation inspection and document the review on an Excavation and Trenching Permit (Form 041 or TVA 29205),found in Appendix D. All excavations in which workers must enter have to

meet the basic requirements for sloping, shoring or shielding found in 29 CFR 1926, Subpart P; *TVA Safety Procedure 804, Excavations and Trenching*.

4.4.7.2 Overhead Utilities

Adequate clearance must be established and maintained for all overhead utilities. These include utilities crossing waterways in and around the site. Prior to conducting work in areas where overhead utilities exist, it is essential that a field inspection be conducted to verify adequate distances will be maintained for all equipment intended to be used in that location. As a minimum, 10 feet of clearance will be maintained between equipment and overhead utilities.

Clearance distances increase as voltage increase:

- For lines rated 50,000 volts or below, minimum clearance between the lines and any equipment part shall be 10 feet.
- For lines rated over 50,000 volts, minimum clearance between the lines and any equipment part shall be 10 feet plus 0.4 inches for each 1,000 volts over 50,000 volts, or twice the length of the line insulator, but never less than 10 feet.
- A minimum of 10 feet of clearance must be maintained from low voltage conductors such as phone, cable, and similar conductors.

4.4.8 Pinch Points / Cutting Edges

Pinch points / cutting edges are a potential hazard in many areas of the work site such as in operating hand tools, vehicle doors, and transporting debris and materials. Pinch points or cutting edges are to be identified on the task-specific JSA and reviewed during tailgate meetings. Work gloves are to be worn by personnel with exposure to pinch points. Cut resistant gloves are to be worn by personnel with exposure to cutting edges.

When activities require the removal of any machine guarding over and around pinch points, it is necessary to implement the LO/TO procedures to prevent inadvertent start up. These must be as stringent as *TVA Safety Procedure 615, Lock-out/Tag-out*.

4.4.9 Low Illumination

Low illumination from diminishing daylight or nightfall due to work schedules is a hazard that may affect all site operations. Lighting requirements onsite are divided into two categories as follows:

- Lighting for Safety – This is defined as the minimum illumination level required for site personnel to safely navigate the site. This accounts for uneven terrain, access points to docks, boats and barges and various grade changes. The requirement for this site is 5 foot-candles. If general illumination levels are less than 5 foot-candles, personal supplemental lighting will be required. Personal supplemental lighting may be from flashlights, headlamps, temporary lighting stands or equivalent sources.
- Task lighting – Addresses the lighting requirements for personnel to effectively and safely perform their assigned tasks. Supplemental lighting may be required for task illumination and should include overhead or pole mounted sources to avoid shadows being cast on work

surfaces / work areas. Due to the significant variety of tasks onsite the following ranges are provided as a guide:

- o Excavation activity, bulk material handling, dredging: 5 foot-candles
- o Construction activity, maintenance, repair: 10 foot-candles
- o Office related work: ≥30 foot-candles

Dredge vessels, barge work platforms and boats intended to be used for rescue efforts must have a working spotlight to be used in the event of emergency. A directional high powered light is essential for night shift rescue activities in the event of a man overboard.

4.4.10 Vehicles and Heavy Equipment Safety

Requirements of *TVA Safety Procedure 711, Heavy Equipment Operations* must be met in regard to all heavy equipment operations. This includes meeting the requirement that an S5 physical or equivalent is provided to all heavy equipment operators. The nature of the work will result in vehicle traffic around the site in the form of heavy equipment such as excavators, backhoes, bulldozers, front end loaders, dump trucks, and field vehicles. Vehicles will also be entering and exiting the site on a regular basis to/from the surface roads.

Onsite controls will include wearing of American National Standards Institute (ANSI) Class 2 (or greater) high-visibility vests when working at any location on the site outside of the immediate office area. Upon initial site mobilization, vehicle and pedestrian traffic patterns onsite will be established and properly communicated to the work crews and equipment operators. Traffic control persons will be identified and used as necessary at any of the intersections of the site and public roads.

Swing radius around heavy equipment must be controlled to prevent workers inadvertently walking into the swing path of equipment. In some instances this may require barricades, cones or caution tape to be utilized. All personnel must establish eye contact and acknowledgement from equipment operators prior to entering the swing radius of operating equipment. When operators are required to interact or talk with ground personnel they must ground their equipment (buckets, etc.) and disengage the controls in order to prevent inadvertent movement.

Under no circumstances are equipment or motor vehicle operators to talk on cell phones while moving / operating equipment. Seat belts are required for operators and any passengers. Site speed limits must be observed.

4.4.11 Rail Activities

All site employees involved in railroad operations must attend training per *TVA Safety Procedure 445, Railroad Safety Course*. This includes laborers lining railcars, equipment operators loading railcars and supervision / management associated with those activities. Requirements for working safely around rail operations are established in *TVA Safety Procedure 812, Railroad Operations* and the site specific *SOP-HSE-020 Interaction with Railroad Operations,* and include:

- Understanding the requirements of Blue Flag markers and allowable locations to cross railroad tracks. If Blue Flags are not present, personnel must verify with Norfolk Southern or other authorized personnel that the tracks are clear to cross.

- Keeping adequate body clearance to avoid injury. Adequate distance is at least arm length from any rotating or moving equipment. Special care shall be given to all pinch points where an employee could be caught between or struck by moving equipment.
- Maintaining awareness when stepping from between rail cars for equipment working on adjacent tracks.
- Reporting defects or obstructions found on tracks to your supervisor immediately. The Supervisor/Foreman shall coordinate the issuance of a work order request. If the tracks in question are utilized by the contract rail carrier, the Master Dispatcher for Norfolk Southern shall be notified.
- Refraining from crawling under a railroad car unless clearance precautions have been taken for maintenance or repair.
- Clearance precautions shall be as a minimum:
    - Three way communications shall be utilized to discuss the work scope and duration of activity with the operator and the switchman
    - The rail car shall not be moved until the maintenance employee communicates face to face with the locomotive operator and switchman the release of the equipment
- Avoiding crawling over couplings unless clearance precautions have been taken for maintenance or repair.
- Not riding on the lead footboard of an engine or sitting on handrails, uncoupling rods, or draw heads of engines or rail cars.
- Avoiding walking or standing on the tracks except in the performance of assigned duties.

4.4.12 Crane Activity

All crane activities will comply with *TVA Safety Procedure 802, Safe Operations of Cranes* including crane operator certification meeting TVA requirements. All rigging activities must comply with *TVA Safety Procedures 721A, Rigging (non-nuclear)* and 7*21C, TVA Rigging Manual* including qualification of riggers.

All crane usage onsite requires a lift plan, the basic Lift Plan and Pre-Lift Checklist (Form 074) can be found in Appendix D. For routine lifts, Figures 1 and 3 of the Lift Plan must be completed prior to the lift.

For repetitive lifts such as those occurring during debris removal in the river, a single plan can be completed which must establish the basic parameters allowed for that activity.

For those lifts meeting one or more of the criteria below, the lift will be considered a high hazard lift. High hazard lifts require completion and approvals of the High Hazard Lift Permit, Figure 2 of the Lift Plan found in Appendix D.

The following parameters define a high hazard lift:

- All lifts over 50 tons.
- When the load exceeds 85% of the cranes capacity, as shown on applicable crane manufacturer's load capacity charts for the configuration to be used.

- Planned engineered lifts when the capacity of an overhead crane is to be exceeded.
- When rigging, attachments, or methods are employed that are not covered in OSHA, the American Society of Mechanical Engineers (ASME), or Rigging Handbook requirements.
- When operating on an inherently hazardous location or under severe weather or emergency conditions.
- When operating with specific operational limits due to abnormal conditions existing with equipment, load, rigging, or facilities.
- Any lift whose failure could damage a high-value, long-procurement item(s) or significantly impact plant operations, shutdown, or equipment availability as determined by site management/superintendent, plant manager, or equivalent level of management.
- Any lift, in which the crane working clearances to adjacent equipment or electrical power lines are within plus 10% of minimum clearances specified in the ASME standard for the respective crane, excluding approved hot-line work.
- Any lift utilizing more than one crane or more than one hook.
- Any lift of humans with platforms attached to a load line.
- Any lift of material/equipment over humans (under special/unique conditions requiring such lifts) or lifts over active work areas, office buildings, public roadways or public transportation systems, e.g., light rail system, expressways, etc.
- Lifts involving non-rigid (flexible) objects such as tank shells.
- Lifts in confined or tight work areas.
- Other activities that should be considered for classification by the Program Manager as a critical lift would include:
    - Lifts over water including crane set up on barges, docks, etc.
    - Lifts made on rubber
    - Lifts of highly valuable or hazardous material
    - When replacement time for damaged load exceeds two months
    - Lifts using more than 200 feet of boom

4.4.13 Electrical Hazards

Electrical generators and associated equipment used onsite must be properly positioned, set up, and maintained. Since the grounding of most portable generators is accomplished through the equipment frame being in contact with the ground, all generators must be set up on the ground or a means of adequate grounding established and tested. For vehicle mounted generators, the frame must be bonded to the vehicle frame per *TVA Safety Procedure 1011, Portable and Vehicle Mounted Generators*.

All outlets onsite will require Ground Fault Circuit Interrupters (GFCI) which should be checked for proper operation prior to each use. All permanently installed outlets or any portable sources onsite longer than a month with GFCI protection are to be tested and documented on a monthly basis.

Properly rated extension cords with three prong plugs are required and must not display any signs of physical damage such as broken or cut insulation. Cords will not be placed where they

may be run over by vehicles or create trip hazards. *TVA Safety Procedure 1004, Extension Cords and Attachments,* addresses extension cords and attachments including color marking for routine inspections unless ground continuity monitors are used.

Appropriate LO/TO methods must be employed per *TVA Safety Procedure 615, Lock-out/Tag-out* when working on electrical equipment or when deficiencies in existing electrical equipment have been identified. Work on energized electrical equipment will not be performed on this site without proper review and coordination from the responsible CM and contractor safety personnel. Reference and review of requirements found in, *TVA Safety Procedure 302, Electric Arc Flash Protection*, and *TVA Safety Procedure 1022, Arc Flash Hazard Calculation* and Required Protection must be made prior to any personnel working on energized electrical equipment.

All work on electrical equipment must be performed by a properly trained and licensed electrician.

4.4.14 Pressurized Systems

Various pressurized systems exist onsite and include pipelines, hydraulic hoses and pneumatic control lines. Basic hazard controls must be implemented for routine use of these systems including whip checks, pins for twist lock fittings, warning signs and worker awareness.

Prior to disassembling any components of a pressurized system, residual or stored energy must be properly bled off. Once this is accomplished, LOTO controls will be implemented to prevent inadvertent start-up of the equipment during maintenance activities. Under no circumstances are adjustments such as bolt tightening to be made on a pressurized system.

During disassembly, maintenance, and start-up activities, control of the “line of fire” must be established to prevent any workers from entering in or standing in areas where a component failure would result in impact to personnel.

4.4.15 Aerial Lifts

Various types of aerial lifts may be utilized on this site. All devices used and the methods of use must meet the requirements of 29 CFR 1926.453 Aerial Lifts and the intent of *TVA Safety Procedure 702, Aerial Lifts* and manufacturer recommendations. Due to the unusual terrain encountered onsite, additional site specific guidance is included in the *Kingston Ash Recovery Project, Project Management Plan*.

In addition, all lifts used onsite must comply with the requirements of ANSI A92.2-1969; lifts manufactured prior to 1973 will not be used on this site unless they have been appropriately modified per manufacturer requirements to comply with the associated ANSI standard.

All personnel utilizing aerial lifts must be trained per manufacturer requirements and be deemed competent to operate the specific devices prior to beginning tasks involving their use. This competent person designation must be in writing and accompany evidence of aerial lift training. These documents must be maintained onsite and be readily available for review.

4.4.16 Moving Machinery / Equipment

Numerous pieces of machinery and equipment will be utilized on this site. Proper precautions and controls must be implemented to prevent inadvertent contact to rotating components such as belt drives, chains, sprockets, pulleys, etc.

All manufacturer guards must be clearly identified and remain in place while equipment is in routine operation. During periods of maintenance or repair, LOTO must be implemented to prevent inadvertent equipment start-up. Only authorized persons will remove machine guarding for maintenance and repair activities.

During JSA review, all rotating equipment and machinery must be identified to all impacted personnel. In addition, the types of guards in use and the location of all emergency stops must be covered with the work crew supporting the activity.

4.4.17 Overhead Hazards

The nature of site activities inherently creates the potential for overhead hazards to exist in most work areas. These hazards are frequently changing scope and location. As such, it is required that all field personnel utilize hard hats while in any work areas outside of the trailer complex. Existing and anticipated overhead hazards should be identified during the pre-task planning process and AHA review.

Overhead work activities such as crane work, work from scaffolding, work from elevated platforms and ladders must be clearly identified to those on the ground. This may require the use of danger tape in the ground area impacted by overhead activities. In areas of high foot traffic, physical barricades may be necessary.

4.4.18 Fire / Explosion

Fire and explosion prevention includes proper housekeeping, proper storage of flammable / combustible materials, use of the hot work permit system, worker training and other controls essential to risk mitigation.

It is also essential that fire extinguishers are strategically placed throughout the site as required. In general extinguishers should be available:

- In all pieces of heavy equipment
- On all boats, barges, dredges and other floating work platforms
- In all trailers
- In all site vehicles
- At all refueling areas
- In all areas where gas or diesel powered equipment is in use

Special conditions apply to refueling activities such as means for proper grounding and bonding, use of proper refueling equipment, worker training and spill control. In the event fixed refueling facilities will be utilized, it is required that pre-use inspections be conducted. Site requirements are further established in *TVA Safety Procedure 906, Combustible and Flammable Liquids*.

Initial and subsequent quarterly inspections will be performed on all refueling areas onsite by Jacobs safety, safety personnel from operating contractors and TVA Environmental.

Hot work on this site is defined as open flame, welding, or spark generating activity. For all hot work onsite, a Hot Work Permit, found in Appendix D must be issued by a site health and safety professional or their designee.

4.4.19 Eye, Face, and Hand

Numerous sources of eye, face and hand injuries exist on the site. All personnel in the field will utilize ANSI Z87 approved safety glasses with side shields as a basic component of PPE. When using cut-off wheels, handheld grinders, wire wheels, welding equipment and oxy-fuel torches, protection such as face shields or welding helmets shall be worn in addition to safety glasses.

Hand injuries can be prevented a number of ways including using the right tool for the job, maintaining handheld equipment in good working order, maintaining tool guards, using the right type of gloves, keeping hand away from pinch points and keeping hands from between stationary objects and moving equipment.

4.4.20 Fly Ash Hazards

When the moisture content of fly ash is low, it can be a stable walking surface. As moisture content increases, movement of individuals and equipment can cause the ash to become unstable and allow the individual or equipment to sink in the material. Several controls are used to protect workers from this hazard.

If there is no work related reason to access an area of ash, then don't. If access is required, use the buddy system or take a means of communication such as a phone or radio. If possible, carry a shovel, rake, etc. to be used for balance, weight distribution, and probing for soft spots.

If activities result in being stuck in the fly ash, don't struggle. Stay calm and call for help immediately. Distribute body weight by sitting to prevent further sinking. Wait for coworkers to retrieve recovery boards stationed around the site to provide a stable platform to work from to assist in freeing the individual from the fly ash.

4.5 CHEMICAL HAZARDS

An evaluation of chemical hazards common to the site have been included in this section. This information should be used as a guide in developing JSAs.

Chemical hazards found onsite include constituents of fly-ash, chemicals used in equipment such as fuel, oil, hydraulic fluids, water treatment chemicals such as flocculating agents used in the dredging operations and acetic acid for pH control, and process chemicals associated with routine plant operations such as ammonia gas.

All listed exposure limits are based on TWA for an 8 hour work shift and 40 hour work week. In instances when work shifts extend beyond these parameters, consideration will be given to adjust the exposure limit accordingly. Such adjustments must take into consideration the extended exposure time and the decreased recovery time associated with longer work shifts. Initially the Brief and Scala model will be used to implement adjustments to exposure limits for

extended work shifts. This model assumes a linear adjustment and does not take into account the specific body burden and toxicology associated with specific chemicals. It is generally considered to be the most conservative model in use.

As an initial guideline, adjustments will be based on Table 4-1

Table 4-1
Chemical Hazard Exposure Limits

Shift	Percentage of Original Exposure Limit to be Used
5 days by 10 Hours (50)	70%
5 days by 12 Hours (60)	50%
6 days by 12 Hours (72)	42%

4.5.1 Properties of Fly Ash Components

Fly ash from coal combustion is the principal material processed and handled during the project. Fly ash is comprised of the following:

- Crystalline silica (3 to 7%)
- Amorphous silica (33 to 57%)
- Aluminum oxide (18 to 31%)
- Iron oxide (5 to 25%)
- Calcium oxide (1 to 6%)
- Magnesium oxide (1 to 2%)
- Titanium oxide (1 to 2%)
- Inorganic arsenic (16 to 210 parts per million)

With the exception of arsenic, crystalline silica has the lowest PEL and the highest relative concentration of all constituents listed for fly ash. As such, it will be used as the indicator contaminant in conducting worker exposure monitoring and will typically be the driver for PPE upgrades.

Crystalline silica does not pose a contact or incidental ingestion hazard. As such, routine work clothing will be worn in areas where airborne limits are below designated PELs. Good personal hygiene, such as hand and face washing, minimizing clothing contact and boot cleaning stations will be utilized to prevent gross quantities of fly ash being transported into office areas, personal vehicles and offsite.

Table 4-2 presents additional information on these chemical constituents. Worker monitoring for potential exposure to fly ash components is discussed in Section 5.0 of this plan.

TVA is a Federal entity and is therefore governed by Federal OSHA PEL's. In addition, there are several contracting partners onsite that are required to follow the Tennessee (TN)-OSHA PEL's.

The PEL's that will be mandated for compliance will be most conservative of either TN or Federal OSHA.

The Threshold Limit Values, (TLV's) found in American Conference of Governmental Industrial Hygienist (ACGIH) and/or the Recommended Exposure Limits (RELs) found in NIOSH will be typically used as a lower level indicator to provide an early warning of potential exposure risks. These indications will provide an opportunity for initiating further reviews, performing an evaluation and implementing subsequent controls that will aid in maintaining exposures as low as reasonably achievable and maintain them to less than the established Action Levels required by law under both TN and Federal OSHA.

Table 4-2
Fly Ash Constituent Information

Constituent[1]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [2]	Lower Level Indicator [3]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Total Particulates	N/A	15 mg/m^3	7.5 mg/m^3	10.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, skin, throat, upper respiratory system	Eyes, skin, respiratory system	0500 37mm
Respirable Particulates	N/A	5.0 mg/m^3	2.5 mg/m^3	3.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, skin, throat, upper respiratory system	Eyes, skin, respiratory system	0600
Silica–Quartz[4] respirable Cristobalite	14808-60-7 14464-46-1	0.05 mg/m^3 TN[6]	0.025 mg/m^3 TLV	0.025 mg/m^3 TLV	Inhalation, skin and/or eye contact, ingestion	Cough, dyspnea wheezing, progressive respiratory symptoms (silieosis), irritation eyes	Eyes, respiratory system	7500 7601 7602
Aluminum Oxide	1344-28-1	15 mg/m^3	7.5 mg/m^3	1.0 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	0500 0600
Antimony (Sb)	7440-36-0	0.5 mg/m^3	0.25 mg/m^3	0.5 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardio-vascular system	7300 37mm
Arsenic [4] (inorganic)	7440-38-2	0.01 mg/m^3	0.005 mg/m^3	0.01 mg/m^3 TLV	Inhalation, skin absorption, skin and/or eye ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbance, peripheral neuropathy, respiratory irritation	Liver, kidneys, skin, lungs, lymphatic system	7300 7301 7303 7900 9102

Constituent[1]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [2]	Lower Level Indicator [3]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Barium (Ba)	7440-39-3	0.5 mg/m^3 TN[6]	0.25 mg/m^3	0.5 mg/m^3 PEL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia	Eyes, skin, respiratory system, heart, central nervous system	7300
Beryllium[5] (Be)	7440-41-7	0.002 mg/m^3	0.0001 mg/m^3	0.00005 mg/m^3 ACGIH TLV: TWA	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, a1	7300
Cadmium[4] (Cd)	7440-43-9	0.005 mg/m^3	0.0025 mg/m^3	0.01 mg/m^3 TLV	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood	7300
Calcium Oxide	1305-78-8	5.0 mg/m^3	2.5 mg/m^3	2.0 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory tract, ulcer, perforation, nasal septum	Eyes, skin, respiratory system	7020 7303

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Chromium Metal (Cr III)	7440-47-3	1 mg/m^3	0.5 mg/m^3	0.5 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	7300
Cobalt	7440-48-4	0.05 mg/m^3 TN[(6)]	0.025 mg/m^3	0.02 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Skin, respiratory system	7300
Copper (Cu-dust)	7440-50-8	1.0 mg/m^3	0.5 mg/m^3	1.0 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	7300
Iron Oxide (Fe_2O_3)	1309-37-1	10 mg/m^3	5.0 mg/m^3	5.0 mg/m^3 REL	Inhalation	Benign pneumoconiosis with x-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)	Respiratory system	7300
Lead (Pb)	7439-92-1	0.05 mg/m^3	0.025 mg/m^3	0.05 mg/m^3 REL, TLV & PEL	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	7300

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Magnesium	1309-48-4	10 mg/m^3 TN[(6)]	5.0 mg/m^3	10.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever	Eyes, respiratory system	7300
Manganese (Mn)	7439-96-5	N/A	N/A	0.2 mg/m^3 TLV	Inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	Respiratory system, central nervous system, blood, kidneys	7300
Molybdenum	7439-98-7	10.0 mg/m^3	5.0 mg/m^3	N/A	Inhalation, ingestion, skin and/or eye contact	In animals: irritation eyes, nose, throat; anorexia, diarrhea, weight loss; listlessness; liver, kidney damage	Eyes, respiratory system, liver, kidneys	7300
Nickel	7440-02-0	0.1 mg/m^3 TN[(6)]	0.05 mg/m^3	0.015 mg/m^3 REL	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	7300
Potassium (as (KOH)	1310-58-3	N/A	N/A	N/A	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; cough, sneezing; eye, skin burns; vomiting, diarrhea	Eyes, skin, respiratory system	7300

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Selenium	7782-49-2	0.2 mg/m^3	0.1 mg/m^3	0.2 mg/m^3 REL, TLV & PEL	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	7300
Sodium (Na)	N/A	N/A	N/A	N/A	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	7300
Thallium (Soluble compounds, as TI)	7440-28-0	0.1 mg/m^3	0.05 mg/m^3	0.02 mg/m^3 TLV (skin)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair	7300
Vanadium	1314-62-1	0.05 mg/m^3 TN[(6)]	0.025 mg/m^3	0.05 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)	Eyes, skin, respiratory system	7300

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Zinc Oxide	1314-13-2	10.0 mg/m^3 TN [(6)]	5.0 mg/m^3	2.0 mg/m^3 TLV	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	7300

NOTES:

(1) Constituents will be sampled as total weight vs. respirable fraction unless otherwise specifically noted within the table.
(2) Based on 50% of the 8 hour site PEL
(3) Based on the lower of the values recognized by NIOSH or ACGIH.
(4) Suspected human carcinogen
(5) Confirmed human carcinogen
(6) State of Tennessee PEL values used over applicable Federal PEL values.

4.5.2 Site and Process Chemicals

Routine chemicals such as fuels, hydraulic fluids and oils are expected to be used onsite. Under normal use, these do not expect to present any unusual chemical hazards to site personnel. If work in enclosed spaces is required, further evaluation will be necessary to determine potential impact.

Any other chemicals intended to be used onsite must be coordinated and cleared through operations and the SSHO prior to their use. If necessary, controls will be established and monitoring protocols implemented to evaluate worker exposure.

4.5.3 Water Treatment Chemicals

Flocculants used to assist in the removal of particulates from water and acids used to maintain appropriate pH levels in the process system tend to pose a contact or dermal hazard. These chemicals must be coordinated and cleared through operations and the SSHO prior to their use. Appropriate chemical protective clothing, eye protection, etc. as well as emergency response equipment such as eye washes and showers will be made available and utilized as appropriate. Specific PPE and operational controls will be identified in the JSA associated with the operation.

4.6 BIOLOGICAL HAZARDS

During the course of the project, there is a potential for workers to come into contact with biological hazards, such as animals, insects, and plants. The JSA will include specific hazards and control measures for these hazards for each task.

4.6.1 Animals

During site operations, animals such as dogs, cats, foxes, rabbits, raccoons, skunks, mice and snakes may be encountered. Workers shall use discretion and avoid all contact with animals. If erratic animal behavior is noticed, personnel will stay clear of the animal and notify the SSHO as soon as possible. If these animals present a problem, efforts will be made to remove them from the site by contacting a licensed pest control technician. If any dead birds are found, the Environmental Program Manager and SSHO must be notified immediately.

The focus of this plan is on venomous snakes that are present in East Tennessee, Copperhead and rattlesnake (timber and western pigmy rattler). The Timber rattlesnake is yellow with black or brown cross-bands or heavy striplings of black or dark brown.

If a snake bite occurs, the victim must be immediately transported to the nearest medical facility. In addition, the snake should be identified if possible by noting color, markings, and size. Interim first aid can be provided by applying ice to the bite area and keeping the victim calm.

4.6.2 Insects

Insects, such as mosquitoes, ticks, bees, and wasps, may be present during certain times of the year. Workers are encouraged to use insect repellents and follow good work and housekeeping practices, control of food wastes, removal of standing water, use of insect repellents, and diligence should minimize the potential for problems to arise as a result of insects. For significant infestations, a licensed exterminator has been contracted to assist in removal. Contact the TVA Kingston Ash Recovery Facilities Manager for assistance.

4.6.3 Stinging Insects

Yellow jackets, wasps, and similar insects may be present in our work areas. Work areas should be checked for the presence of nests/hives prior to setting up the site. Any workers known to be allergic to these insects should relay this information to their supervisor, SSHO and associated crew members. If the employee carries an epinephrine pen to counteract stings, they should instruct their counterparts on the proper use of the device in the event they become incapacitated and cannot self administer the injection.

4.6.4 Spiders

In East Tennessee, spiders of potential medical concern are the brown recluse and black widow. Spiders may hide in clothing and PPE. Clothing should be inspected prior to donning. If personnel sustain a spider bite, it is to be reported to the SSHO. Information on these two spiders follows.

Brown Recluse is a small size arachnid. It measures approximately 0.25 to 0.5 inches (7 to 12mm) long. The brown recluse spider color is generally brown and its body shows a peculiar cephalothorax with a dark brown spot in a violin form; the legs are light brown and the abdomen, of an oval aspect, is dark brown, yellow, or greenish yellow. The most important characteristic is the existence of three pairs of eyes in the cephalothorax.

Black Widow is 1.5 inches (38mm) long, 0.25 inches (6.4mm) in diameter with a colored hourglass shape on their abdomens. Most people who are bitten suffer no serious damage, let alone death. But bites can be fatal—usually to small children, the elderly, or the infirm. Fortunately, fatalities are fairly rare. The spiders are nonaggressive and bite only in self-defense, such as when someone accidentally sits on them.

4.6.5 Ticks

All personnel and contractors should be aware of the potential presence of ticks in wooded areas. Rocky Mountain Spotted Fever is the most prevalent tick-borne disease in East Tennessee and may be transmitted by a dog tick. The early clinical presentation of Rocky Mountain Spotted Fever is often nonspecific and may resemble many other infectious and non-infectious diseases. Initial symptoms of Rocky Mountain Spotted Fever may include fever, nausea, vomiting, muscle pain, lack of appetite, and severe headache.

Specific precautions include:

- Wearing hooded coveralls to cover your body as much as possible. Light color clothing makes spotting of ticks easier.
- Eliminating possible paths by which the tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape or gators may be utilized to help seal cuffs and ankles).
- If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized.
- Conducting periodic and frequent (e.g., hourly) surveys of your clothing for the presence of ticks. Remove any ticks/insects that become attached to clothing.

- Using insect/tick repellents per the directions on the label. Repellents containing the compound N,N diethyl-meta-toluamide (DEET) can be used on exposed skin except for the face, but they do not kill ticks and are not 100% effective in discouraging ticks from biting. Products containing permethrin kill ticks, but they cannot be used on the skin, only on clothing. When using any of these chemicals, follow label directions carefully.

- When removing ticks, use tweezers, and grab the tick as closely to the skin as possible. Do not try to remove ticks by squeezing them, coating them with petroleum jelly, or burning them with a match.
- If you remove a very small tick and want to have it tested for a tick-borne disease, place it in a clean pill vial or tight-sealed plastic storage bag.

Report any of the above symptoms and all tick bites to the SSHO for evaluation.

4.6.6 Poisonous Plants

Plants such as poison ivy and poison sumac may be prevalent at the site during certain times of the year. Poison ivy is a kind of harmful vine or shrub in the cashew family, and usually grows as a vine twining on tree trunks or straggling over the ground, however, the plant often forms upright bushes if it has no support to climb upon. The leaves of poison ivy are red in early spring, later in spring, they change to shiny green, then in fall turn red or orange. Each leaf is made up of three leaflets more or less notched at the edges. Two of the leaflets form a pair on opposite sides of the leafstalk, while the third stands by itself at the tip of the leafstalk.

The key to avoiding exposure is the ability to recognize and avoid the plants. If it is necessary to work in wooded areas, the JSA should include discussion on how to recognize poisonous plants.

4.6.7 Blood borne Pathogens

Those personnel who provide first aid could be exposed to Blood-Borne Pathogens (BBP); therefore, all personnel who are trained in First Aid/cardiopulmonary resuscitation (CPR) must participate in BBP Training. The primary pathogens of concern are the Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (also known as HIV). Typically this training is provided by the CPR and/or First Aid training providers.

4.6.8 Pandemic Planning

The *TVA Pandemic Plan, Health and Safety Practice 8*, addresses actions for site personnel to take to maintain essential functions prior to, during, and after a pandemic - a global disease outbreak in humans. Site personnel are required to follow the direction of the Pandemic Planning Teams.

5.0 HEALTH HAZARD MONITORING

TVA will arrange for worker monitoring for exposure to potential occupational health hazards including air contaminants, noise, and thermal stress as illustrated on Figure 1 (Appendix I). The results will be compared to associated action levels to make decisions about adequacy of PPE levels, effectiveness of work practice controls and need for medical monitoring.

When feasible, direct reading instrumentation will be used as initial exposure screening to ascertain the need for integrated monitoring such as noise dosimetry, integrated air monitoring and personal heat stress monitoring. Direct reading instrument levels will also be used, when possible, to prioritize the sequence of integrated monitoring for the different exposure groups onsite.

If feasible, while integrated monitoring is performed, direct reading levels will be recorded with the expectation that a correlation can be established between direct reading instrument levels and integrated monitoring. If an adequate correlation can be established, exposure checks can be performed using direct reading instruments.

In addition to worker monitoring, the work site and property perimeter will be monitored for total dust levels and when necessary to establish PPE zones within the work areas.

5.1 AIR CONTAMINANTS

5.1.1 Integrated Air Sampling

The PHSM, SSHO and Lead Industrial Hygiene Technologist, concurrent with activities that may generate contaminants in excess of 25% of the established PEL shall perform assessment and evaluation of exposures to airborne contaminants through integrated personal sampling. This may include sampling for silica, respirable dust or associated heavy metals known to exist in fly ash. Refer to Appendix B, Health Hazard Evaluation for discussion of task anticipated contaminants, and exposure probability.

When integrated monitoring is performed, a statistically significant sample of workers per the direction of the PHSM and recommended NIOSH sample methods will be selected for exposure monitoring. Nearby areas or employees may be monitored if it is suspected a dispersed impact of the contaminants of concern however, these personnel will not count towards the statistical significance of the task workers monitored. Refer to Appendix K for full details of the Industrial Hygiene Monitoring Plan.

5.1.1.1 Exposure Group Evaluation

An evaluation of all tasks will be performed to determine recognized exposure groups within each activity. Once this has been done, a review of existing data from samples already collected will be evaluated and if possible correlated to exposure groups identified for each task. If data gaps exist, additional monitoring will be performed until all exposure groups have been adequately characterized until at least a 95 percentile confidence level has been achieved.

5.1.1.2 Routine Monitoring

Once all exposure groups are adequately characterized, routine monitoring will be performed on those groups perceived to be at highest risk based on collected data. Typically this will include the following in order of highest priority:

- Exposure groups showing results higher than established action levels (50% of the established site PEL (most restrictive of Federal or TN OSHA).
- Exposure groups showing results greater than the established PEL
- Exposure groups routinely working in areas with highest total dust concentrations independent of chemical specific results
- Exposure groups working in direct proximity to any of the above groups

Routine monitoring will be performed until statistical significance to at least the 95th percentile has been established for all groups and all data is properly validated.

Integrated monitoring should be documented on a form similar to the Integrated Air Monitoring Record (Form 077) found in Appendix D.

5.1.1.3 Cessation of Integrated Monitoring

Reduction or cessation of air monitoring may be approved by the PHSM when the rationale for the modification is documented in a field change notice. Rationale may include the following conditions:

- Adequate exposure group characterization has been achieved, generally to the 95% confidence level. This may be independent of whether integrated results indicate exposures above or below the associated PEL,
- A process change occurs or engineering controls implemented which effectively decreases monitoring levels to less than 25% of the associated PEL,
- Completion or cessation of the associated task or removal of the associated exposure group from the exposure environment.

5.1.2 Direct Read Instrument Screening

After the start of any new task, project phase or field activity and when feasible for the contaminants of concern, exposure groups should be screened using direct reading instruments. If this is performed it should be done as soon as possible, with areas of highest potential exposures screened first. Direct reading measurements should be recorded on the Direct Read Air Monitoring (Form 075) found in Appendix D.

In order to keep a screening approach conservative and adequately protective of worker health, direct readings for dust will be assumed respirable dust and the upper percentage limits given for the various metals identified on fly-ash Material Safety Data Sheets (MSDS) will be assumed to be present in all dust readings.

Information used during screening can be used to help prioritize exposure groups for integrated monitoring, but in no way shall be used to replace integrated monitoring data.

5.2 DATA QUALITY ASSURANCE

5.2.1 Calibration

Instrument calibration shall be documented and included in a dedicated safety and health log book or on separate calibration pages. An Instrument Calibration Log (Form 072) for direct reading instruments can be found in Appendix D. All instruments shall be calibrated before use. A calibration check must be conducted at the end of shift or sampling event. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

Air sampling pumps used to collect worker exposure samples shall be calibrated before use with a calibration check being performed at the end of sampling or shift. Calibration shall be accomplished using a primary standard calibration system (e.g., bubble tube or dry piston calibrators). (See SOP-HSE-037 Industrial Hygiene Personal Air Monitoring Procedure.) Results of the calibrations shall be included on air sampling data sheets. Differences in pre and post calibration may be cause for voiding associated data collected on those instruments.

5.2.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment, will be maintained onsite by the SSHO for reference.

Samples sent to a laboratory for analysis shall be packaged to prevent damage, spillage, or leaks. An appropriate number of blank samples must be included per the NIOSH sample method being utilized.

An air or bulk sample data sheet with chain-of-custody information must accompany any sample shipped.

5.2.3 Data Review

The PHSM or Certified Industrial Hygienist (CIH) designee (IH Lead Technologist) will interpret monitoring data with peer review by another CIH as necessary. Personnel exposure results will be tabulated and posted at the site, as soon as possible after results are received. Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PHSM.

5.2.4 Laboratories

Only analytical laboratories accredited by the American Industrial Hygiene Association shall perform chemical analysis of samples collected for assessment of employee exposures through integrated monitoring. The laboratory analysis will include field blanks, as required by the individual method or laboratory. Duplicate samples or splits with other laboratories may be used during the project. Laboratories may be required to submit a copy of their Accreditation Certificate and most recent Quarterly PAT Performance Report.

5.2.5 Noise Monitoring

Noise monitoring may be conducted in areas adjacent to heavy equipment operation or any other potential elevated noise source including the site perimeter. Work zones will be established and posted where hearing protection must be worn. Workers with 8-hour TWA exposures exceeding 85 dBA (82 dBA for 12 hour TWA) must be included in their company's hearing conservation program.

5.3 HEAT STRESS MONITORING

Monitoring shall be conducted as necessary to assist in determining initial work/rest regimens and to verify that these regimens are adequate as the work progresses. Heat stress monitoring shall be performed in accordance with guidance given in the latest edition of *TVA Safety Procedure 806, Heat Stress*. Two primary monitoring methods are used depending on the type of protective clothing worn: 1) WBGT monitoring when wearing permeable protective clothing; and 2) Personal physiological monitoring when wearing impermeable protective clothing or working in areas of higher thermal loading than ambient conditions (i.e. interior of rail cars, confined spaces, etc). As a minimum, each contractor onsite shall provide, if work scope warrants, a qualified person able to count and record pulses/minute and read and record body temperatures as a means to fully implement the personal physiological monitoring.

5.3.1 Ambient Monitoring

Personal physiologic monitoring (heart rate and body temperature, and fluid loss, if possible) of workers shall be used to assist in determining work-rest regimens whenever impermeable protective clothing is worn.

5.3.1.1 Wet Bulb Globe Temperature Technique

Keep in mind that disposable clothing such as Tyvek and raingear may be considered air or water vapor impermeable. The WBGT index is not normally used to determine work/rest regimens for impermeable protective clothing because the index takes into account the effects of evaporative cooling. Impermeable protective clothing impedes evaporative cooling; however, *TVA Safety Procedure 806, Heat Stress* provides guidelines on work/rest regimens when wearing protective clothing.

When appropriate, a WBGT index will be measured on the site per the guidelines established by the ACGIH. When the measured index exceeds established limits for the type of work being performed, work / rest cycles will be implemented accordingly. This information will be passed to each contractor's SSHO for coordination and implementation with their operations managers.

5.3.1.2 Adjusted Temperature Technique

The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing are the ambient temperature and radiant (solar) heat.

These factors are combined into an index called the "adjusted temperature" using the formula shown below. In this formula, ambient temperature is measured with a dry bulb thermometer shielded from the sun, and the percent sunshine is the percent time the sun is not covered by clouds that are thick enough to produce a shadow.

Adjusted Temperature °F = ambient temperature °F + (13 x percent sunshine as a decimal)

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. The length of the work cycle is governed by the frequency of the required physiological monitoring. Initially, rest periods are at least 15 minutes per cycle.

5.3.2 Personal Monitoring

A person competent to accurately measure pulse and/or body temperature shall perform physiologic monitoring when other forms of monitoring for heat stress conditions are deemed inaccurate for the environment or activity. Measure the worker's pulse, either at the carotid (neck) or radial (wrist) artery at the beginning of the shift and periodically thereafter based on work activities. The following formula will be used to calculate the maximum pulse rate based on the age of an acclimatized worker.

Maximum pulse rate [beats per minute (bpm)] = (180 – age); if the pulse rate has not gone below 110 bpm after one minute, allow the worker to continue to recover.

If pulse measurement is not feasible, then aural temperature measurements may be used.

Like the pulse measurement, an initial measurement is necessary for a baseline value.

When core temperature for the acclimatized worker exceeds 101.3 °F or for the unacclimatized worker exceeds 100.4 °F, a rest period will be used to allow the worker to recover.

Any worker exhibiting signs of heat stress will be removed from the area for rest in a cool area. Heat strain symptoms will be monitored to ensure the worker does not progress into heat stroke. If the symptoms of heat stroke occur, the worker will be taken for immediate emergency care.

Monitoring results shall be recorded on a Heat Stress Physiological Monitoring form that must be approved by Jacobs. The form must be organized so that an individual worker's measurements for a full workweek can be recorded on one form. The program should contain, at a minimum, the elements of *TVA Safety Procedure 806, Heat Stress*.

Personal heat stress monitoring is the least preferred approach since site wide conclusions cannot be drawn from the effort due to the significant variability in the results. Therefore, personal heat stress monitoring will be performed any time area monitoring is considered inaccurate or not representative of a given task or exposure scenario.

5.4 COLD STRESS MONITORING

Cold stress monitoring will be conducted in accordance with Jacobs *HSEP 11.4, Cold Stress Control*. Considerations will include ambient temperature, wind speed, type of work being performed and thermal warming effects. Warming breaks may be implemented based upon these considerations.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 GENERAL REQUIREMENTS

The PPE outlined in this section has been selected according to the site characterization and analysis, job tasks, site hazards, intended use, and duration of potential employee exposures.

Maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring of effectiveness, and PPE limitations are outlined in this section.

A site-specific respiratory protection program has been established when use of such equipment is intended to lessen the potential for adverse health effects to any employee. The respiratory protection program for the site is detailed in Appendix C, and is to be followed should respiratory protection be required.

For those activities where fly ash is being processed dry, modified Level D PPE may be required. The key for exposure control is to prevent dust accumulation on clothing, hair and skin which in turn prevents prolonged passive exposures. Protective clothing in the form of dedicated coveralls and dedicated site work boots may be required if conditions warrant.

In the event that PPE items may create a hazard during the performance of specific tasks, such as wearing a high visibility vest during open flame or welding activity, the requirement may be waived. In order to waive the requirement, the JSA must document what the hazard is and why the PPE item creates a greater hazard with its use. With the exception of removing a high-visibility vest during hot work, other changes to basic PPE requirements must be approved by a site SSHO.

6.2 LEVELS OF PROTECTION

6.2.1 Level D Protection

Minimum level of PPE required in all non-office work environments:

- Coveralls or work clothing as dictated by the weather
- Steel-toe work boots (ANSI Z41)
- Safety glasses with permanent side shields (ANSI Z87)
- Hard hat, Type E (ANSI Z89.1)
- High visibility yellow reflective vests (ANSI Z107)

6.2.2 Level C Protection

All components of Level D Protection, plus:

- Hooded chemical coveralls suitable for particulates (DuPont ProShield®, NexGen™ or Tyvek®)
- Gloves outer – leather, nitrile, neoprene or natural rubber
- Gloves inner – cotton
- Full face or half mask respirator with P-100 filter (dependent on protection factor needed)

- Chemical protective boots or boot covers
- Safety glasses (with half mask)

6.2.3 Levels A and B

Based on present site knowledge, protective Levels A and B will not be required.

6.3 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

The selection of specific types of PPE will be conducted after a thorough evaluation of the potential hazards involved for each task. Site specific addenda will evaluate the planned tasks, potential chemical hazards, nature of environmental conditions, and other factors when determining specific types of PPE to be used. The initial PPE to be worn is provided in Appendix B.

Changes to initial levels of protection may be requested by Project Management whenever site conditions warrant, but must be approved by the SSHO and PHSM. PPE change request will be submitted on the PPE Downgrade Rationale (Form 079) found in Appendix D. Once approved changes will be made to the associated AHA as appropriate.

7.0 ACTIVITY HAZARD ANALYSIS

The AHA is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid; control and mitigate those hazards. The AHAs will be used to train work crews in identifying and controlling hazards prior to beginning a task.

Each contractor's operations staff and site safety professionals are responsible for developing accurate AHAs for work or to obtain them from their subcontractors, and review them for accuracy.

7.1 TASK SPECIFIC ACTIVITY HAZARD ANALYSES

Based on the scope of work, AHAs have been developed for the tasks expected to be performed onsite and are located in Appendix E. Additional AHAs will be developed as needed.

The AHA is used as an initial hazard analysis, guide for the development of JSAs, planning, training, and auditing tool and is usually completed by a HSE professional. The JSA is a task specific planning tool and is completed by the craft lead on or just prior to the actual day of activity.

7.2 JOB SAFETY ANALYSIS DEVELOPMENT FROM ACTIVITY HAZARD ANALYSIS

The superintendent or foreman as well as the work crew participate in developing the JSA as a collective effort. A JSA is required for each work task on a daily basis.

The following steps can be used to assist in developing a JSA:

1. Check Appendix E and determine if an AHA is already developed for the task, if so print a copy.

2. If no AHA is available, consult with the SSHO to assist in completing one for your task(s).

3. Prior to starting work on the first day of your task, review the original AHA with your work crew. Consider weather, nearby activities, changing conditions and any relevant items which may impact your plans.

4. Cross items off your AHA which do not apply. Add items by annotating directly on the document. If necessary use a blank AHA to note your additions.

5. Have the entire work crew sign the annotated document which acknowledges their understanding of the hazards and controls. This annotated and signed AHA becomes your JSA.

6. On subsequent days, use the AHA review document found in Appendix D with your work crew to address specific details impacting your task. Have the work crew sign the review document. The annotated and signed review document becomes your JSA and must remain with the original AHA

7. Once the task is complete or at the end of the week, each contractor must turn all annotated AHAs and JSAs in to their safety group.

7.3 NEW PHASES OF WORK

Hazard analysis for activities involving short term or discrete tasks can be addressed utilizing AHAs and JSAs. For larger or longer term pieces of work it may be necessary to develop an addendum to this SWSHP.

8.0 WORK ZONES, SITE CONTROL, AND PERSONAL HYGIENE

Site control will be maintained in part, by identifying, delineating or communicating the locations of EZs, CRZs, and SZs. Those zones are defined as follows:

- Exclusion Zones – Work areas where fly ash is handled, stockpiled or otherwise actively being manipulated.
- Contamination Reduction Zones – Areas where personnel and equipment cleaning and / or decontamination is occurring. Also areas where fly ash exists from the original release, but is not being actively manipulated.
- Support Zones – Office areas, equipment storage areas, public roads or other areas not meeting the definition of an EZ or CRZ. It is imperative that these areas remain free of fly ash. If this cannot be accomplished they may be deemed an EZ or CRZ as appropriate.

Figure 2 (Appendix I) provides an overview of the established site zones; Figure 2 (Appendix I) illustrates the typical work area layout. All changes to the EZ need to be approved by the Remedial Project Manager. The notification and approval process can be conducted verbally or via e-transmission, but is to be followed up with the Work Zone Classification Change Notice (Form 085) found in Appendix D within 48 hours. Changes that last more than 2 weeks will require a modification to the SWSHP. These changes must also be explained to those personnel working in impacted areas.

With the exception of those individuals who meet the exceptions outlined in Section 11.0, only those authorized workers who have completed proper HAZWOPER training, medical monitoring when applicable and site orientation will be allowed to enter an EZ or CRZ. This approach will help keep untrained personnel away from higher hazard operations and reduce the number of workers in work areas. As work progresses and field conditions are monitored, work zone boundaries and site drawings may be modified. Work zones shall be clearly identified and marked using fences, signs, or tape when necessary.

Cleaning or decontamination of site vehicles prior to leaving the associated CRZ is required if the vehicles will be entering a support zone or traveling through nearby residential areas. Dedicated areas will be identified and equipped onsite for the vehicle cleaning, dust and dirt removal. Workers who are exposed to fly ash and dust at levels above the PEL or who frequently contact ash during the performance of their duties may be expected to wear coveralls and dedicated boots to avoid transferring materials offsite or to their personal vehicles.

8.1 BASIC WORK PRACTICES

One of the most important aspects of site control is good personal hygiene. This should minimize dispersion of materials, eliminate potential worker exposure and help ensure valid sample results by precluding cross contamination. Some recognized protocols are:

- Do not walk through areas containing fly ash unless integral to planned activities.
- Minimize direct handling or touching of materials.
- Make sure there are no cuts or tears in work clothing and PPE.
- Take particular care to protect any skin injuries.
- Stay upwind of material handling activities whenever possible.

- With the following exceptions, do not eat, drink or use tobacco products (smoking, dipping, chewing) in any EZ or CRZ:
  - Drinking, eating and tobacco use are allowed in approved SZs within the EZ and designated support areas outside of the EZs and CRZs.
  - Drinking water is allowed in enclosed cab, filtered heavy equipment (not motor vehicles) provided the equipment interior remains clean. This will likely require daily wet wiping and vacuuming of equipment interior to meet this requirement.
- Do not leave food in any EZ or CRZ work areas, if food is carried into these areas it must be brought directly to the interior SZs.
- Minimize the number of personnel and amount of equipment in an EZ or CRZ to that necessary for accomplishing the work.
- Whenever possible, designate site vehicles and equipment to be used for EZ, CRZ use only.
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned.
- Keep excavated materials in dedicated areas and out of the way of workers.
- Upon exiting work areas, thoroughly clean hands and face, and remove any debris from work clothing. If wearing Level C PPE, perform proper dry decontamination and dispose of used PPE properly.

8.2 PERSONNEL HYGIENE FACILITIES AND CLEANING PROCEDURES

With the exception of personnel remaining in clean vehicles throughout their visit, personnel exiting EZs shall clean or be decontaminated as appropriate. All contaminated equipment and materials will be washed, rinsed and/or removed and disposed of in the EZ area or other designated location. Single use PPE will be disposed of in designated containers. A personnel decontamination area will be set up according to the type of work being conducted and the contamination level present. Table 8-1 lists the typical configurations for the decontamination stations. Figure 4 (Appendix I) is a schematic of a typical decontamination area layout.

Table 8-1
Standard Decontamination Station Configurations

Level D	Level C
1. Equipment drop	1. Equipment drop
2. Hand cleaning (arms and face as necessary)	2. Outer boot and glove wash
3. Boot wash	3. Outer boot and glove rinse
	4. Tape removal - boot and glove
	5. Outer boot and glove removal
	6. Coverall removal and disposal
	7. Respirator removal
	8. Inner glove removal and disposal
	9. Inner clothing removal
	10. Hand/face cleaning
	11. Shower when required
	12. Redress
	13. Respirator cleaning and sanitizing

8.2.1 General Cleaning Requirements

At a minimum, all personnel will thoroughly clean their hands upon exiting an EZ or CRZ prior to eating, drinking, using tobacco products (smoking, dipping, chewing), or any other actions that would increase the risk of material transfer. When necessary, the arms and face should also be washed.

All personnel must also thoroughly clean their boots and any clothing that has contacted ash. Boot washes are provided at all personnel entry control points and vehicle entry control points. In addition they are made available to the entrance of all interior SZs within the site.

Showering is a "best-practice" measure that is initiated to prevent the potential or perceived perception of offsite migration of contaminants, particularly to a worker's home. The determination of the shower requirement will be made by the PHSM and SSHO, in consultation with TVA personnel, and will be specified in the task-specific AHA.

8.2.2 Task Specific Cleaning Requirements

If certain tasks require decontamination procedures that differ from the general decontamination regimes described above, then it will be specified in the task-specific AHAs, and will be reviewed with all personnel prior to work.

Personnel performing certain tasks in some areas may be required to remove street clothes before the workday begins and shower at the end of the workday. Site-issued cotton coveralls may also be required. Showering is typically specified for those tasks where workers perform activities in dusty environments and the PEL for exposure to crystalline silica is exceeded. This increases the possibility that contamination could be on the worker's body, hair, etc. A shower located at the medic trailer would be provided in such cases.

8.2.3 Non-routine Cleaning Requirements

In the event of gross ash contact, such as an individual falling into wet ash, becoming stuck, sprayed, etc. a complete clothing change and shower is recommended. A shower facility will be provided onsite to be used for this type of circumstance (located at the Medic Trailer). Any clothing that has been covered in ash must be thoroughly cleaned prior to being removed from the site.

8.2.4 Bathroom Facilities

Water supply and bathroom facilities will be provided per the requirements of 29 CFR 1910.120(n). The requirements include:

- An adequate supply of potable water shall be provided on the site.
- Outlets for non-potable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.
- Toilets per the site population meeting the requirements of Table H-120.2, Toilet Facilities. Typically one toilet seat and one urinal per 50 people.

8.3 EQUIPMENT DECONTAMINATION

A centralized heavy equipment decontamination area will be established onsite to accommodate large pieces of equipment and vehicles being permanently removed from the site.

Each contractor shall have a competent person to be consulted for specific decontamination requirements and procedures and to verify equipment temporarily or permanently leaving the site is properly cleaned. These guidelines are as follows:

- Vehicles and equipment, in general, should be free of all ash, dirt and/or residue. All large quantities of ash and or dirt will be removed (clumps/piles) both inside and outside of the vehicles and equipment.
- Both power washers and water truck hoses are approved for use. All areas of equipment or vehicles should be sprayed if they can be reached. No disassembly of heavy equipment or vehicles is required.
- If an area cannot be cleaned after a substantial amount of time due to limitations of approved cleaning equipment, a supervisor/foreman shall make the determination to move on. Workers need to inform supervisors/foremen of these problem areas.
- Actuation of moving parts should be done to accommodate complete cleaning.
- Avoid water cleaning of areas containing large quantities of grease or oil. Utilize rags/pads in these areas to ensure gross quantities of grease and/or ash are removed.
- Maintain consistency in inspections. Supervisors, foremen, and workers shall take time to ensure complete coverage of vehicles and/or equipment.

8.4 DECONTAMINATION DURING MEDICAL EMERGENCIES

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving First Aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Any personnel requiring medical attention will be given priority during personnel decontamination. Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces or the individual will be suited in an additional clean coverall to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

8.5 WASTE COLLECTION AND DISPOSAL

All material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly controlled, stored and disposed of per the Kingston Ash Recovery Project Waste Handling Plan.

In the case of liquids and sludges, this may include controlled discharge points or recycling back into the Rim Ditch or Sluice Trench.

With solid wastes this may include disposal with the ash.

9.0 MEDICAL SURVEILLANCE AND SUPPORT REQUIREMENTS

Health exposure monitoring data may indicate the need for medical monitoring per associated OSHA requirements (29 CFR 1910.120 or 29 CFR 1910 Subpart Z). Once health exposure monitoring determinations have been completed for a given exposure group, the PHSM will review the exposure levels and with the assistance of the Jacobs medical consultant when necessary, determine what type of medical monitoring, will be required. This surveillance could include biological monitoring for specific compounds or specialized medical examinations. As a minimum, employees exposed above any PEL for 30 or more days per year will receive the medical examinations required by 29 CFR 1910.120(f).

9.1 RESPIRATOR USE QUALIFICATION

Personnel required to wear respiratory protection must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained onsite and be made available for review if necessary. Documentation of a current, successful respirator fit-test conducted in accordance with OSHA requirements must be also maintained onsite.

10.0 EMERGENCY RESPONSE PLAN

Project emergencies happen unexpectedly and quickly and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures that must be addressed include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred onsite, record keeping, and emergency site evacuation procedures.

Evaluation of emergency response drills and actual emergencies will be documented on the Emergency Response Best Practice (Form 076) found in Appendix D. This process will help track what occurred, how the response proceeded and what changes if any are required to the Emergency Response and Contingency Plan.

Roane County Emergency Services is the primary agency responsible for supporting this site. Per their request, the Kingston Ash Recovery Project will not develop a plan separate from the TVA KIF. In order to meet their request, the KIF Emergency Response Plan (ERP) will incorporate the requirements and needs of the Kingston Ash Recovery Project.

The following information includes emergency scenarios which are addressed in the KIF ERP. Details are provided in Appendix F for those instances where the Ash Recovery Site response includes unique details that are not completely addressed in the KIF ERP.

An emergency notification phone tree has been established for this site and details are included in Table 15-1 under Section 15.4.2.

If either localized or site-wide evacuation is required, affected personnel are to report to their designated assembly areas as soon as possible so all personnel can be accounted for. Designated assembly areas are identified on Figure FIII - Emergency Assembly Areas, located in Appendix F.

It is the responsibility of each contractor and organization onsite to account for their personnel. Within 30 minutes of an ordered evacuation, a headcount and status must be reported to the Jacobs HSE Manager who will then report status to the TVA and Jacobs onsite Program Manager. The TVA Shift Operations Supervisor must then be notified of evacuation status.

10.1 FIRE / EXPLOSION

Personnel onsite are not required to fight fires, however incipient stage fires may be extinguished with portable fire extinguishers which have been staged throughout the site. In any event of fire, the KIF Shift Operations Supervisor must be contacted at 865-717-2120 or the Electrical Control Operator at 865-717-2141.

In the event of a large fire or explosion, 911 should be contacted immediately, the Shift Operations Supervisor must then be contacted and may choose to initiate the KIF ERP.

10.2 MEDICAL EMERGENCIES

The KIF ERP has been updated to include medical emergencies occurring on the Kingston Ash Recovery Project site. As required by TVA, a site specific AED Program has been developed and is titled *SOP-HSE-019 Site-Specific Automated External Defibrillator (AED) Program.*

The following have been addressed and included here for reference:

10.2.1 Emergency Medical Service Site Access and Initial Response

Primary Emergency Medical Service (EMS) access to the site will be via the construction entrance located on Swan Pond Road. Those personnel calling 911 during an emergency must send a runner to this entrance to escort EMS to the victim's location. In addition, arrangements must be made to meet the onsite paramedic at Personnel Entry Control Point #9 (near the rail spur crossing) and transport them to the victim's location. If the injury occurred on the water and the victim cannot be moved, the paramedic will be transported to the Skimmer Wall boat ramp where they can be brought to the incident scene. If the victim can be moved, the paramedic may either meet up with the moving transport boat or meet the transport boat at the designated Water Extraction Point (WEP). To summarize, the medical emergency response steps are as follows:

- CALL 911
- Declare a medical emergency on channel 1 of the site radio. Request assistance to the area.
- Call TVA Police for escort or send a runner. 800-824-3861
- Call the site paramedic. 865 755-2556
- Ensure the area is safe and if trained, provide care

10.2.2 On-Water Medical Response

In the event of an on-water injury requiring emergency response, a list of WEPs must be used to facilitate transitioning the victim from the water to an ambulance. The WEP locations are identified in Appendix F and include:

- Table FV - Water Extraction Point Descriptions
- Figure FIVa - KIF Access Locations
- Figure FIVb - KIF Access Locations North of I40
- Figure FIVc - KIF Access Locations South of I40

These should be laminated and kept on board vessels in emergency kits for easy reference.

If it is determined that it is unsafe to move the victim from the incident scene, the onsite paramedic will assist in the initial response and will be transported to the victim's location via boat.

10.3 HAZARDOUS MATERIAL / ENVIRONMENTAL RELEASE

For hazar5dous materials and environmental release, the KIF ERP will be followed. Designated shelters are identified on Figure FV - Emergency Chemical Shelters located in Appendix F.

In the event of a non-emergency hazardous material release, local notification must be made to Program Management, Site Safety, and Site Environmental. Those numbers are listed on Table 15-1 under Section 15.4.2.

10.4 ANTHRAX

In the treat of anthrax, the KIF EAP will be followed.

10.5 WEAPONS OF MASS DESTRUCTION

In the threat of weapons of mass destruction, the KIF EAP will be followed.

10.6 NATURAL DISASTERS / TORNADO

For natural disasters and tornadoes, the KIF ERP will be followed. Designated shelters are identified on Figure VIa - Severe Weather Shelters (site wide) and Figure VI b - Severe Weather Shelters (at the KIF), located in Appendix F.

During inclement weather, the SSHO will monitor for severe weather using the internet and hand-held lightning devices. The National Oceanic Atmospheric Association and Doppler Radar will be used to determine the severity of weather conditions. The weather report, the size of the severe weather cell, the speed the cell is traveling and the direction of travel will be used to determine action to be taken for sheltering site employees.

When monitoring the weather indicates that the weather conditions are not subsiding or that a tornado warning is likely, departure of all project site personnel from the site will be evaluated by the SSHO.

If severe weather or a tornado watch has been issued, an announcement over the site radio emergency channel 1 will be issued with directions for work suspension or site evacuation. All personnel must remain within ready access of one of the tornado shelters.

If tornado warnings are imminent or have been issued and project personnel are still onsite employees will seek shelter in the locations listed below when the notification is made by the SSHO.

Personnel are to report to the nearest shelter and report to their supervisor. Car pooling with co-workers is encouraged. Buses will be used to transport field workers.

The SSHO will notify the Plant Electrical Control Building (ECB) 717-2141 and request the Scrubber Gate #25 and the Plant Filter Plant Gate be opened. The ECB operator will notify the Shift Operations Supervisor and the Scrubber Operator to open the gates.

Shelter locations are assigned in accordance with the employees work location. Since employees work in different locations on a daily basis their shelter may also change. To MAXIMIZE the available parking space BLOCKING cars in is PREFERRED. Exiting the parking area will be coordinated after the event.

10.6.1 Shelter Locations at the North End of the Project Site

To MAXIMIZE the available parking space BLOCKING cars in is PREFERRED. Exiting the parking area will be coordinated after the event. See Figure VIa - KIF Access Locations (site wide), located in Appendix F. Emergency shelters at the north end of the site are located at:

- Berkshire House – Designated for employees working in the EZ close to this area. The Berkshire House basement will house approximately 100 people.
- 119 Lakeshore Drive – Designated for employees working on the Emory River. This house basement will house approximately 100 people.
- 145 Lakeshore Drive – Designated for employees working on the north end of the Kingston Ash Recovery Site. This house basement will house approximately 10 people.
- 179 Lakeshore Drive – Designated for Water Sampling group. This house will house approximately 50 people.

10.6.2 Shelter Locations at the South End of the Project Site

Employees need to drive and park at the furthest south parking area identified a the south stack shelter until that area is full and then park in the North Stack parking area until that area is full and then park in the FGD stack parking area. See Figure VIb - KIF Access Locations (at the plant), located in Appendix F. Emergency shelters at the plant are located at:

- South Stack – Employees will drive to the north Scrubber access gate, drive past the Scrubber Stack, past the South Stack, and park between the Coal Yard Crusher Building and South Stack. The stack will house approximately 100 people.
- North Stack – Employees will drive to the north Scrubber access gate, drive past the Scrubber Stack, and park around the North Stack. The stack will house approximately 100 people.
- Scrubber Stack – Employees will drive to the north Scrubber access gate and park in the area of the Scrubber stack. The sack will house approximately 200 people.

10.7 LIGHTNING / SEVERE WEATHER

In the event a thunderstorm is forecasted, the SSHO, or designee, will monitor the activity on the National Weather Service (NWS) local Doppler Radar. Additionally, all site personnel will keep an “eye to the sky”, observing conditions. Operations will temporarily cease and an evaluation of the risk will be conducted when it is determined that thunderstorm cells are within 8 miles of the site, based on NWS Doppler Radar, lightning detection equipment or if lightning is observed from any location. If it is deemed that the storm presents an immediate or pending danger to work crews, work will remain suspended.

Lightning shut down and restart of operations will be announced on the site radios. Operations will restart 30 minutes after the last lightning is observed, unless NWS local Doppler Radar shows other storms approaching.

Severe weather procedures, including special marine considerations are further addressed in Appendix F, Severe Weather Procedures.

10.8 DAM FAILURE / FLOOD

For dam failure or flood danger, the KIF EAP process will be followed.

10.9 BOMB THREAT

In the event of a bomb threat, the KIF EAP process will be followed.

10.10 CIVIL DISTURBANCE

In the event of a civil disturbance, the KIF EAP process will be followed.

10.11 CRIMINAL ACTIVITY AND ILLEGAL ENTRY

In the event of criminal activity and illegal entry, the KIF EAP will be followed.

10.12 SUSPICIOUS PACKAGES

In the event of suspicious packages, the KIF EAP will be followed.

10.13 EVACUATION / SHELTER

In the event of evacuation or need to seek shelter, the KIF EAP process will be followed.

11.0 TRAINING AND SSHO MEETINGS

All project employers shall provide their employees with the health and safety training required to comply with subcontract requirements, achieve compliance with TVA requirements, regulatory standards, and other training and qualification necessary for an employee to complete the assigned job duties safely. This training will include HAZWOPER Training per 29 CFR 1910.120, Competent Person training and/or training required by 29 CFR 1926.21, General Safety Training and Education.

Assigned site personnel (craft and labor) are required to have the 10-hour OSHA Construction training and other modules prior to working onsite. Appendix G lists TVA training requirements which may apply.

Training for excavation competent person, crane operations and rigging *must* be obtained using the TVA specific courses. All other training must be evaluated for compliance with TVA requirements and industry standards. Training meeting the expectations and intent of these will not require retraining with TVA courses.

Documentation of required training (e.g., training certificates or attendance rosters) will be maintained onsite by each contractor and be available for review upon request by Jacobs, TVA, or regulatory agencies such as OSHA.

11.1 HAZWOPER TRAINING

Hazardous Waste Operations and Emergency Response training will be completed by site personnel as outlined in the following sections:

11.1.1 General Site Personnel

All general site personnel being provided unrestricted access to EZs and CRZs shall complete 40 hours of classroom training per 29 CFR 1910.120(e)(3)(i). In addition to the classroom training, a 24 hour period of supervised field experience must be documented using the Completion of Supervised Field Experience (Form 080) found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

Personnel completing this training will receive a blue badge which indicates open site access to complete a broad range of tasks.

11.1.2 Task Specific Personnel

All personnel accessing EZs or CRZs for limited durations and specific tasks such as surveying, shall complete 24 hours of classroom training per 29 CFR 1910.120(e)(3)(ii). In addition to the classroom training, an 8 hour period of supervised field experience must be documented using Form 080 found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

Personnel completing this training will be issued a red badge which indicates a focused site effort and narrowly defined site tasks.

11.1.3 Supervisory Training

Onsite management and supervisors directly responsible for, or who supervise employees engaged in hazardous waste operations must receive 40 hours initial training, and 3 days of supervised field experience and at least eight additional hours of specialized training per the requirements of 20 CFR 1910.120(e)(4).

Personnel completing this training will be issued a green badge indicating broad site access and the ability and responsibility to function in a supervisory role.

11.1.4 Support Zone Personnel

Personnel who do not enter EZs or CRZs are not required to attend HAZWOPER training, however site specific orientation must still be provided. Personnel not possessing HAZWOPER training will be issued a white badge.

11.1.5 Exceptions to Training Requirements

Those personnel being provided access to the site under all of the following conditions will not be required to meet the training requirements identified in Sections 11.1.1 through 11.1.4:

- Will be onsite not more than one day per month
- Will be escorted by an authorized individual possessing the knowledge and authority to effectively function in an escort role and who has completed 40 hour HAZWOPER training
- Will be performing hands-off activities
- Will attend visitor orientation and sign in and out during each visit.

11.2 SITE-SPECIFIC TRAINING/ORIENTATION

Prior to commencement of field activities, all personnel assigned to the project will have completed site-specific training that will address the contents of applicable AHAs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, locations of EZs, CRZs, potential hazards, risks associated with identified hazardous substances at the site, hazard communication as necessary, PPE, incident reporting, emergency response actions, and available emergency services. Each individual attending the training will be issued the Kingston Ash Recovery Project Site Wide Safety and Health Plan Booklet for quick reference of site rules.

This training allows workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity. The Jacobs SSHO will conduct this training.

All escorted visitors must review the visitor ESH presentation and be provided a brief orientation relative to their specific function or tasks on the site. Once this is complete the visitor log must be signed by the visitor. The log should be signed for each visit.

11.2.1 Ammonia Awareness

Ammonia Awareness training will be completed by all personnel with the exception of escorted visitors. TVA provides this training and is required prior to being issued a badge.

11.2.2 Railroad Safety

All site personnel working directly with or around rail operations must complete Railroad Safety training or equivalent as identified in *TVA Safety Procedure 445, Railroad Safety Course*.

11.3 FIRST AID AND CARDIOPULMONARY RESUSCITATION

Training consistent with the requirements of the American Red Cross will be provided for an adequate number of onsite personnel to provide support during an emergency situation. It is expected that a minimum of two personnel per active field operation per shift will have First Aid and CPR training.

As required per the site specific AED program, an adequate number of personnel must be trained in the use of the AEDs which are staged throughout the site. Only AED trained personnel are authorized to utilize this equipment in an emergency. A site specific AED procedure has been developed for this site. This procedure describes locations for staging AEDs, inspection process and training requirements.

11.4 BLOODBORNE PATHOGENS

Employee information and training for BBP shall be provided by the employer as required in 29 CFR 1910.1030 for all onsite contractor and subcontractor personnel who will be working in areas where pathogens may be present. This is only required for personnel whose assigned duties may create reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials.

11.5 OTHER REQUIRED TRAINING AND QUALIFICATIONS

Other training and qualifications may be required depending on the task work scope and assigned duties of an individual employee. This may include training for waste handling, hazardous materials transportation, respiratory protection, noise exposure or hearing conservation, and various Qualified and/or Competent Person requirements (e.g., operation of heavy equipment, forklifts, confined space entry, excavations, cranes, LO/TO).

Crane Operators must be certified by TVA in accordance with *TVA Safety Procedure 802, Safe Operation of Cranes* and riggers must be trained in accordance with *TVA Safety Procedure 721A, Rigging (non-nuclear)*.

Equipment operators working on floating work platforms such as barges must be properly trained to do so and designated competent by contractor supervisory personnel. This includes those personnel required to operate heavy equipment and stationary mounted equipment such as drum hoists (tuggers).

Specific additional training and/or qualified/competent person requirements will be identified through the AHA or task-specific health and safety planning process. The contractor employer is responsible for ensuring that identified training and/or qualified/competent person requirements are met for site workers. Documentation of this certification must be maintained onsite and be readily available for review. A list of qualified and/or competent persons will be maintained for each process or operation at the work locations.

12.0 HAZARD COMMUNICATION

Employee information and training on the Hazard Communication (HAZCOM) program shall be provided as part of the site-specific training. The following are required elements of the information and training program:

- Overview of HAZCOM as described in 29 CFR 1910.1200 and *TVA Procedure 216, Hazard Communication*;
- Ammonia awareness training per TVA requirements;
- A review of any operations in their work areas that involve hazardous materials;
- The location and availability of the written HAZCOM materials, including the list(s) of hazardous chemicals and MSDSs;
- Methods and observations that may be used for detecting the presence or release of hazardous chemicals;
- An understanding of the physical and health hazards of hazardous chemicals in the work area;
- How to understand the information in MSDSs;
- How to read the warnings on container labels including the National Fire Protection Association system;
- When and how to report leaks and spills;
- How to recognize the symptoms of overexposure and how to protect against it; and
- How to implement exposure control methods including work practices, engineering controls, administrative controls, PPE, and emergency procedures.

In the event that a new chemical hazard or new task is introduced in the workplace, the SSHO or designee shall conduct additional training that includes the following:

- Objectives of the task, if applicable;
- Physical and health hazards associated with the new chemical hazard or task;
- Methods to detect the presence or release of the hazardous chemicals;
- Procedures and practices recommended to protect themselves from the hazards;
- Emergency procedures in the event of a hazardous situation or exposure; and
- Location and availability of the written program, lists of chemicals, and MSDS.

Documentation is to be maintained for each employee trained in HAZCOM in accordance with *TVA Safety Procedure 401, Health and Safety Training* or equivalent.

Subcontractors working for Jacobs shall be required to meet the ESH requirements outlined in their contracts.

13.0 SUBSTANCE ABUSE

All site employers shall maintain and implement a Drug Free Workplace program for site work activities. Use, or working under the influence of controlled substances (other than prescribed or over-the-counter medication) or alcohol on the job is strictly prohibited.

Site workers are subject to substance abuse testing at any time “for cause” or following a safety or property damage incident. Contractors are responsible for ensuring that pre-work and post-incident drug and alcohol testing are performed. Positive substance abuse tests resulting from “for cause” or post-incident substance abuse testing shall be reported to the Jacobs PHSM or SSHO immediately.

14.0 MEETINGS

14.1 DAILY SAFETY MEETINGS

All project field personnel, including subcontractors, shall participate in daily safety meetings prior to the start of each work shift. The Site Tailgate Meeting (Form 081) can be found in Appendix D. This form or equivalent can be used to document daily safety meetings.

The meeting shall include a discussion of the planned work activities and periodic special safety topics of interest to site personnel. Project personnel may be requested by Jacobs to present a safety briefing based upon their scope of work. In addition, the following items shall also be discussed as appropriate:

- Necessary training requirements and site work rules.
- Changes in work practices or environmental conditions.
- Precautions or safe work practices related to the day's site activities.
- New or modified site-wide procedures or requirements.
- Bulletins or Safety Reports provided by Jacobs.
- JSA review for each work group.

14.2 WEEKLY SITE SAFETY AND HEALTH STAFF MEETINGS

All designated contractor SSHO representatives must attend a weekly meeting chaired by the Jacobs PHSM or designee. The meeting will review program status, air monitoring results, upcoming activities, lessons learned and other topics deemed relevant by the group.

14.3 PROGRESS MEETINGS

The PSHM or designee will attend progress meetings and other meetings as requested by project team or client.

15.0 LOGS, REPORTS, AND RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

15.1 MEDICAL AND TRAINING RECORDS

Copies or verification of training and medical clearance for use of respiratory protection, heavy equipment and crane operation will be maintained onsite by each contractor's designated SSHO. This includes records for all subcontractor employees.

Proof of initial HAZWOPER, annual refresher and supervisor training as appropriate must be provided during the initial pre-entry briefing. Workers will not be granted site access to EZs or CRZs without training documentation.

15.2 WEEKLY SAFETY REPORTS

All contractors on the project shall generate a Weekly Safety Report. The Weekly Safety Report should be maintained onsite and be readily available for review. The report may include a brief summary of significant safety activities, and the following items as necessary:

- Summaries of incidents, investigation findings, corrective actions and their status
- Copies of the site First Aid log if there are new entries;
- Copies of completed "Safety Observations Reports".

15.3 EXPOSURE RECORDS

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the contractor HSM during site work. At the end of the project they will be maintained according the 29 CFR 1910.120 and TVA procedures.

15.4 INCIDENT REPORTING, INVESTIGATION, AND CASE MANAGEMENT

15.4.1 Incident Definition

For all site activities, an incident is defined as follows:

- A work-related injury or illness.
- An exposure to a hazardous substance above the allowable exposure limit.
- Property/vehicle/equipment damage.
- An uncontrolled fire or explosion.
- A work stoppage due to lightning or tornado.
- An unplanned spill or release (including air releases) to the environment.
- A permit or permit equivalent exceedance.
- Any unexpected contact or damage to aboveground or below ground utilities.

- A "near miss" or an unplanned event that has a reasonable probability of resulting in one of the outcomes described above had the circumstances been different, and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome.

15.4.2 Verbal Notifications

All Project personnel have the responsibility to immediately report any incident to their supervisor. Individuals shall take appropriate corrective action and immediately verbally report the incident to the individuals identified in Table 15-1.

Table 15-1
Notification

Project Notification[1] – HSE Personnel to Call		
Name	**Organization**	**Number**
Steve McCracken	TVA – GM	423-413-1197
Jack Howard	Jacobs – PM	865-399-7971
Danny Whitaker-Sheppard	Jacobs – HSE Manager	865-300-7441
Appropriate CM	Jacobs	
TVA Police	TVAP	800-824-3861 / 800-632-3631
Jacobs CM to Call		
Appropriate Jacobs Project Mgr.		
Michelle Cagley (If environmental)	TVA – Environmental	865-696-5038
SOS (If environ. or derailment)	TVA – Kingston Plant	865-717-2119
Jacobs HSE Manager to Call		
Kathryn Nash	TVA PM	423-290-7820
Chuck Proffitt	TVA –SR MGR Safety FGD&C	615-476-2327
Tom Heffernan	TVA – HSE	423-994-8582
TVA Sr. Manager	On Weekend Duty	See Weekly Board or email
Jacobs PM Personnel to Call		
Appropriate TVA TCM		
Katie Kline	TVA Community Outreach	865-621-8125
Barbara Scott	TDEC	865-230-1211
Medical Support Contacts		
Plant Nurse *(Mon – Thu; 0600 – 1600)*	TVA	865-717-2589
Paramedics *(7 days week; 24 hrs/day)*	TVA	865-755-2556
TVA Police	TVA	800-824-3861
Fire Response Contacts		
Roane County Fire[2,3]	Roane County	911

Notes:

1. Provide initial medical care and initiate emergency control activities prior to making project notifications.
2. If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
3. TVA has a dedicated fire brigade for in-plant response. For activities occurring out onsite, Roane County Fire (911) will provide primary response.

15.4.3 Incident Reports

An initial written incident report will be prepared for all incidents during the work shift when the incident occurred. With assistance of the supporting SSHO, the report is to be prepared by the supervisor responsible for the activity/area where the incident occurred and be submitted to the Jacobs HSE Manager for distribution no later than 24 hours after occurrence. As a minimum, the report will include a summary of what occurred, causal factors and actions to prevent reoccurrence. In addition to the standard distribution lists, the associated Jacobs PM must be included in the distribution as well.

All incidents categorized as first aid or worse (including near misses) will be entered into the TVA Problem Evaluation Report system by the Jacobs Methods and Process Coordinator. In the event the incident results in a recordable injury or is likely to evolve into a recordable injury, the Task Managed Contractor Preliminary / Incident Report (TVA 20260) found in Appendix D must be completed and sent by the TVA Ash Recovery Program Manager within 24 hours via the email distribution identified at the bottom of the form.

15.4.4 Investigation Follow-Up

All contractors on the project shall establish a follow-up system for all investigation findings under their control. The system shall identify the corrective action(s) to be taken, the individual responsible for each corrective action, and the date the corrective action was implemented or verified.

15.4.5 Management of Potential Injuries Or Illnesses

All contractors on the project are responsible for implementing and maintaining an effective Case Management program for their employees and contractor employees that addresses potential injuries or illnesses related to work at the site. The goal of the case management program is to ensure that workers receive the appropriate level of care, that injured or ill workers return to normal work duties as soon as possible, that injury or illness records are consistently and accurately maintained, that unnecessary or fraudulent injury or illness cases are avoided, and that the contractor actively seeks to minimize the impact of any incident with respect to recordability, restricted duty, and lost time aspects.

The case management program shall include the following elements:

- Employee Information – Each site worker shall be informed of the project incident reporting and investigation requirements and their responsibilities in the event that an incident occurs, including the location and hours of operation for the designated local medical provider.
- Employee Points of Contact – Each site worker shall be made aware of the primary person to report all incidents to, and what to do if that individual is unavailable. This includes whom to notify if a work-related condition develops or intensifies outside normal working hours.
- Subcontractor Representation at Clinic Visits – A knowledgeable contractor representative shall accompany any worker seeking medical attention for any incident related to work at the project. The contractor representative shall be knowledgeable in the worker's normal job duties; potential safety and health hazards present at the worksite, and be able to discuss any limitation or modification of normal duties with the local medical provider staff. The representative shall also be knowledgeable (or have access to someone who is knowledgeable) of treatment options that provide equivalent medical attention while avoiding

any impact to recordability, restricted duty, and lost time recordkeeping. Items that may affect the recording status of an injury or illness (such as prescription medications, limitations to normal job duties, and further treatment) shall be reviewed with the medical provider at the time of the visit to ensure that appropriate medical attention is provided with a minimum of impact to recordkeeping.

- Status Reporting to Jacobs – Contractors shall keep the Jacobs SSHO informed of case management status, progress, and issues for the duration of any evaluation or treatment provided. The contractor shall provide updated information to the Jacobs SSHO regarding injury or illness status within 24 hours of each visit or change in status regarding recordability, restricted duty, or lost time.

15.4.6 OSHA Form 300

Each contractor is responsible for keeping their own OSHA Forms 300, 301 and 301A at the project site. All OSHA Recordable injuries or illnesses will be recorded on these forms as appropriate. Contractor employers must also meet the requirements of maintaining the OSHA Injury and Illness forms. The criteria for determining OSHA Recordability will also follow the guidelines of 29 CFR 1904.4.

In addition, Form 300A, Annual Summary must be submitted to the Jacobs SSHO each year by January 21, this will allow adequate time to generate a site wide OSHA 300A log and have it posted by February 1.

15.5 HEALTH AND SAFETY LOGBOOKS

All contractors and subcontractors shall complete and maintain logbooks in the field to document health and safety-related events as they occur during the day. Logbooks should document any significant safety-related information such as site monitoring and calibration, sampling, weather conditions, conversations, changes to PPE requirements, unusual conditions, and other items related to site health and safety.

The following logbook guidelines should be used:

- Use blue or black ink.
- Write clearly, print if necessary.
- Use an underline (rather than highlighter) to emphasize important information.
- Do not use correction fluid - draw one line through errors, write the correction above, then initial and date next to the correction.
- Start a new day at the top of a page with identifying information such as the project name, location, and date.
- Add entries in chronological order and note the time periodically throughout the day.
- If there is blank space at the end of the day, mark through it with a slash or N/A and initial at the bottom of the last page for the day.

15.6 HAZARD COMMUNICATION PROGRAM/MSDS

MSDS will be obtained for applicable substances and included in the site HAZCOM file. The HAZCOM program will be maintained onsite in accordance with 29 CFR 1910.1200 and *TVA Safety Procedure 216, Hazard Communication*.

15.7 WORK PERMITS

All work permits, including confined space entry, hot work, LO/TO, excavation and trenching, etc., will be maintained in each contractors project files.

Issuance of permits should be coordinated through the response site SSHO.

15.8 INSPECTIONS AND STRUCTURED FIELD VISITS

Regular inspections of active fieldwork areas shall be conducted to identify and correct potential worksite hazards as outlined below. The Jacobs equipment inspection forms may be used and may be modified as desired to reflect task- or site-specific health and safety issues.

Administrative operations such as offices and storage areas have less frequent inspection requirements as the working conditions, and work practices in these areas are not expected to change as rapidly as active field work areas. The trailer and storage areas will be inspected on a monthly basis (fire extinguishers and First Aid kits) and on a quarterly basis in accordance with Jacobs *HSEP 6.9, Warehouse Safety.*

15.8.1 Daily Inspections (Health and Safety Supervisor or Designee)

Daily informal inspections of active field work area(s) will be conducted. The inspection shall cover workplace conditions, physical facility safety, and employee work practices. The inspection, conducted by the SSHO, shall include a walk-around of the site and a review of workplace conditions and work practices. The SSHO shall document any deficiencies and corrective actions in a logbook.

15.8.2 Weekly Inspections (Site Supervision)

Informal weekly inspections of the active field work area(s) will be conducted. The inspection shall be performed by the first line supervisor, superintendent, or equivalent supervisory position and the Jacobs SSHO. The inspection shall include a review of work activities and an evaluation of compliance with required procedures and plans, a walk-around of the site, physical facility safety, and employee work practices.

Noted discrepancies and areas of achievement can be documented on the Jacobs Safety Observation Report (Form 061) found in Appendix D.

15.8.3 Safety Coaching Visits

Monthly visits of active field work area(s) will be conducted. The PM or their designee shall perform Safety Coaching Visits using the TVA Safety Coaching Visit (Form 020) program and checklist found in Appendix D. Contractors shall schedule the time of the monthly inspection in advance with the Jacobs PM.

15.8.4 Client Sponsored Site Visits – Trilateral Safety Alliance

TVA will conduct weekly site visits using the Trilateral Safety Alliance group. This group involves union contractors, client personnel and union craft personnel. This is a highly effective program that provides an opportunity for input by trade personnel onsite. All union contractors will be expected to support this program.

15.8.5 Equipment Inspections

Any equipment, including construction equipment, as well as watercraft, must be maintained in a safe operating condition. To assist in achieving this, formal documented inspections of specific equipment must be performed on a routine basis. Some equipment must be inspected on a daily basis using forms developed for the specific piece of equipment. The Jacobs SSHO will provide forms or assist in the development of forms if one is not available. Additionally, an initial inspection of all construction equipment and floating plant will be performed by the contractor. Selected inspection forms are included in Appendix D.

15.8.6 Corrective Action

Corrective actions shall be implemented in a timely manner and tracked through completion. Findings for weekly, monthly, or quarterly site inspections not completed or verified by the next scheduled inspection shall be reentered on the subsequent inspection form (with the date of the original inspection added at the end of the corrective action). Corrective actions should be carried forward on each subsequent inspection until the corrective action is completed or verified. The notation 'F' (for carried forward) shall be made in the Date corrected column of the site inspection form whenever a finding is carried forward to a subsequent inspection.

Contractors shall implement corrective actions to inspection findings at the time of the inspection, where feasible. Interim corrective actions shall be implemented as necessary for areas that present an immediate hazard to site workers. Interim corrective actions may include suspension of work, barricading unsafe areas, posting of warning signs or other similar measures to effectively mitigate the immediate hazard.

15.8.7 Annual Closeout Safety Report

An Annual Closeout Safety Report is required at the completion of each calendar year. Information provided in the Daily Safety Report does not have to be duplicated in the Closeout Report. The Closeout Report shall be submitted to the Jacobs Fed-Ops HSE Manager by the PHSM no later than March 1 each year. The report will cover the following items:

- A description of significant events, exposures, incidents, First Aid cases, and actions taken to prevent their recurrence.
- A copy of the OSHA 300 log for site work.

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc. 2010. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*. Cincinnati, OH. ACGIH.

National Institute of Occupational Safety and Health. *NIOSH Pocket Guide to Chemical Hazards.* http://www.cdc.gov/NIOSH/npg. (27 February 2009).

U.S. Army Corps of Engineers. 2003. *Safety and Health Requirements Manual.* EM385-1-1. Washington, D.C.

U.S. Department of Labor. Occupational Health Administration Regulations (Standards – 29CFR). http://www.osha.gov/pls/osha.web. 27 February 2009.

TVA Safety Manual, Rev. 13, January 26, 2009.

APPENDIX A

APPLICABLE PROGRAMS, PROCEDURES, AND GUIDELINES

Applicable TVA Safety Procedures

Applicable Jacobs HSE Procedures

APPLICABLE TVA SAFETY PROCEDURES

Procedure No.	Procedure Name
General Safety	
207	General Safety Rules and Employee Conduct
215	Hazard Assessment
216	Hazard Communication
217	Safety Coaching Visits
220	Safety Meetings
226	Safety Stand-down
303	Emergency Shower and Eye Wash
304	Eye and Face Protection
305	Fall Protection Systems
306	Flotation Devices
307	Foot Protection
308	Hand Protection
309	Head Protection
310	Hearing Conservation
312	Respiratory Protection
Training	
401	Health and Safety Training
406	Boating Safety Training
414	Defensive Driver Training
418	Ergonomics Training
419	Excavation – Affected Person Training
420	Excavation – Competent Person Training
421	Fall Protection Training
422	Vehicle Flagging Training
423	Forklift Operations Training
425	Hand and Portable Power Tools Training
426	Handling and Storage of Compressed Gas Training
427	Hazard Recognition Training
430	Hearing Conservation Course
431	Heat Stress Course
435	Safety Coaching Visits Training
436	Job Safety Analysis Training
437	Ladder Safety Course
438	Lock-out / Tag-out Training
441	Personal Protective Equipment Training
445	Railroad Safety Course

Procedure No.	Procedure Name
447	Respiratory Protection Course
448	Rigging Course
449	River and Deck Skills Course
451	Supervisory Safety Orientation
455	OSHA 10-Hour Construction Course
General Safety	
602	Barricades and Barriers
603	Boating Safety
606	Hand Tools
607	Housekeeping
609	Lifting and Handling Materials
610	Motor Vehicle Operations
611	Office Safety
612	Warning Signs
615	Lock-out / Tag-out
616	Manual Material Handling
Mechanical	
705	Compressed Air
706	Compressed Gas Cylinders
707	Conveyor Systems
710	Grinding and Cutting
711	Heavy Equipment Operations
713	Portable Ladders
714	Machine Guarding
718	Pneumatic Tools
719	Portable Heating Equipment
721A	Rigging (non-nuclear)
Special Work Requirements	
802	Safe Operations of Cranes
804	Excavations and Trenching
805	Forklift Operations
806	Heat Stress
809	Hot Work
810	Marine Operations
812	Railroad Operations
814	Underwater Diving
815	Welding and Cutting
KIF.EP.14.00.001	KIF Emergency Response Plan

Procedure No.	Procedure Name
Chemical / Hazardous Material	
901	Ammonia
906	Combustible and Flammable Liquids
913	Silica
Electrical - General	
1007	Ground Fault Circuit Interrupters
1011	Portable and Vehicle Mounted Generators
1012	Portable Electrical Tools and Attachments

APPLICABLE JACOBS SAFETY PROCEDURES

Procedure No.	Procedure Name
General Safety	
2.9	Subcontractor Adherence Policy
6.9	Warehouse Safety
11.4	Cold Stress Control
12.1	Health Hazard Evaluation
13.9	Respiratory Protection Program
15.3	Work Over or Adjacent to Water

JACOBS

HSE Procedure		Document No: HSEP 2.9	Page: 1 of 5
Subcontractor HSE		Supersedes: HSEP 2.9	Revision: 3 Issue Date: 15 Oct 08
Issuing Department: Corporate HSE	Approval: Brandon.Russell@Jacobs.com	Previous Rev. & Issue Date: Rev 2, 19 Aug 05	Effective Date: 15 Dec 08

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1.0 PURPOSE AND SCOPE

The goal of an accident and incident free job site can only be achieved through a cooperative effort by all contractors and workers on the entire project. This HSEP provides guidelines to be used when selecting subcontractors. It also provides HSE requirements to be implemented by subcontractors and their employees, who work on Company projects. It applies to subcontractors that have a contractual relationship with the Company and their lower-tier subcontractors.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 DEFINITIONS

Accident/Incident	An unplanned, undesirable event that disrupts work activity.
Attachment A	Refers to a document containing HSE Requirements for contractors, which is part of the contracts documents package that is generally referred to by HSE, the Contracts Management Group, and others as “Attachment A.”
Experience Modification Rating (EMR)	EMR is maintained exclusively by the insurance industry, is a comparison of the actual losses charged to an employer during the experience period with the losses that would be expected for an average employer reporting the same exposures in each classification. The published manual rate for each state is multiplied by the employer’s EMR to determine the premium rate paid by the employer. An EMR below 1.00 indicates that the employer will pay premiums below the manual rate. Calculating the EMR is often complex and different states have different rules that an insurance company must follow.
Contractor	Jacobs Engineering Group or the Jacobs operating group or subsidiary company named in this contract in which these Subcontractor HSE requirements are incorporated.
Contracts Management	CMG refers to the Jacobs Contracts Management Group and is sometimes use synonymously with the terms purchasing manager, subcontracts or

Group (CMG)	procurement department, etc.
Safe Plan of Action (SPA)	A task-specific planning document used to help ensure that every task receives proper HSE assessment and planning. Also referred to as a Job Safety Analysis (JSA) in some locations.
Subcontractor	The party, including "subconsultants", defined in the subcontract with Contractor for which these subcontractor HSE Requirements are incorporated. Subcontractor HSE requirements shall extend to and govern Subcontractor's subcontractors, vendors, employees, and others under its direction or control.
Site/Project Management	The highest-ranking Contractor representative whose regular work location/office is at the project site.
Task Safety Awareness (TSA)	A review of the SPA among the crew and supervisor to discuss and resolve any HSE issues before work is continued, when there has been a break in the work schedule, change in work conditions, change in crew, etc.

4.0 HSE REQUIREMENTS

All prospective subcontractors shall be required to submit details of their recent HSE performance history as part of the bid evaluation process. Both the HSE Department and Operations management shall review this information as part of the formal evaluation and selection process.

All prospective subcontractors shall be provided a copy of Jacobs HSE requirements as part of the bid process. These requirements define Company HSE program elements and best practices and may exceed client or local regulatory agency rules and standards. Subcontractor requirements will also be thoroughly reviewed with subcontractor management representatives prior to their work beginning.

4.1. For Prospective Subcontractors in the US

HSE requirements for subcontractors, who will be evaluated for work in the US, are set forth in Attachment A, HSE Requirements for US Contractors, the project Hazard Assessment Safety Action Plan (HASAP), and Jacobs Health, Safety, and Environment Procedures (HSEPs). Attachment A will be appended to contracts made with subcontractors and subconsultants. The subcontractors shall be informed that Jacobs HSEPs are available upon request.

The Contracts Management Group (CMG) will require prospective subcontractors to complete the Subcontractor HSE Data Form (Exhibit 1 in Attachment A, HSE Requirements for US Contractors). The completed HSE Data Form will be forwarded to the HSE Department for evaluation.

The Contracts Management Group will classify subcontractors based on experience with the subcontractor on Jacobs projects and based on the review of Subcontractor HSE Data Form.

To facilitate the evaluation and classification, *either* the Jacobs Subcontractor Injury Performance Standard (JSIPS) *or* the Applicant Contractor HSE Rating Worksheet should be used by the HSE Department to determine appropriate classification.

- Jacobs Subcontractor Injury Performance Standard (JSIPS) is based on applicants' EMR and comparison of their incidence rates with the industry averages found in the North American Industry Classification System. This evaluation is typically performed by the Contracts Management Group with support from the HSE Department.
- Applicant Contractor HSE Rating Worksheet uses information provided by the applicant in the Subcontractor HSE Data Form, Exhibit 1, in Attachment A. This evaluation should be performed by the HSE Department.

If a client or contracting partner evaluation process is determined by Jacobs HSE to be equivalent to these pre-qualification processes, it may be used.

4.2. For Prospective Subcontractors in Canada

HSE requirements for subcontractor, who will be evaluated for work in Canada, are set forth in Attachment A, HSE Requirements for Subcontractors in Canada.

4.2.1. The Contracts Management Group shall:

- Require prospective subcontractors to complete the Subcontractor Prequalification Evaluation Form for Canadian Operations.
- Require prospective subcontractors to complete the Pre-Qualification Document Checklist found in Attachment A, HSE Requirements for Subcontractors in Canada.
- Append Attachment A to contracts made with subcontractors and sub consultants.
- Forward the completed Subcontractor Prequalification Evaluation Form for Canadian Operations and accompanying documents to the HSE Department for evaluation.
- Retain all subcontractor documentation
- Maintain the subcontractor pre-qualification database.
- Forward all correspondence and requests for additional information or clarification to the subcontractor.
- Notify the subcontractor that they shall complete the Risk Mitigation Plan for Canadian Operations and submit it to Jacobs for evaluation and approval.
- Forward a copy of the successful applicants' Subcontractor Prequalification Evaluation Form for Canadian Operations including any accompanying documentation to the project/construction management.

4.2.2. The HSE Department will:

- Consider experience with the contractor on Jacobs projects.
- Use the Subcontractor Prequalification Evaluation Guidelines for Canadian Operations to evaluate each prospective subcontractor.
- Return the completed pre-qualification form to the Contracts Management Group for follow-up.
- Identify and notify the Contracts Management Group of any subcontractors requiring a Contractor Risk Mitigation Plan for Canadian Operations.
- Retain an electronic copy of all subcontractor evaluation forms.
- Review and approve, in conjunction with the Project/Construction department, all Risk Mitigation Plans.

4.2.3. Based on the evaluations, the HSE Department will classify each Subcontractor as either:

- Approved, based on the following criteria.
  - Meets Jacobs requirements for HSE performance, WCB ratings, and HSE management system.
- Conditionally Approved, based on the following criteria.
  - Performance and/or HSE management system does not meet all requirements.

  A Contractor Risk Mitigation Plan for Canadian Operations is required for all conditionally approved subcontractors.
- Unacceptable, based on the following criteria.
  - Subcontractor does not meet minimum HSE requirements.

Subcontractors in this category can qualify to bid on future work providing they have a formal action plan in place and are showing improvement. Prior to qualifying, they must have approval of the Project/Construction Manager and Senior HSE Manager.

4.3. For Prospective Subcontractors in All Other Countries

For subcontractors in all other countries, the HSE Department will provide a document that defines Jacobs HSE requirements for subcontractors that incorporates appropriate local regulations, terms and expressions, titles, HSE performance expectations, etc.

The subcontractor HSE requirements document will be provided to the Jacobs Contracts Management Group to be appended to contracts made with subcontractors and subconsultants.

Based on experience with the subcontractor on Jacobs projects and on a review of information submitted by the subcontractor, the HSE department will utilize methods described in 4.1, as appropriate, to evaluate and classify applicant subcontractors as

- Acceptable — meets Jacobs requirements for HSE performance;
- Marginal — performance and/or HSE management program do not meet all HSE requirements; use of a marginal applicant requires a written HSE improvement plan from the applicant that is acceptable to both a Senior HSE Manager and Operations management. See Contractor Risk Mitigation Plan For Canadian Operations for a sample format; or
- Not acceptable — subcontractor does not meet minimum HSE requirements.

4.4. For Selected Subcontractors in All Countries

All provisions of Attachment A, HSE Requirements for US Contractors, the project HASAP, Jacobs HSEPs, and the provisions of the local, country/region-specific version shall be followed. If a conflict exists among those provisions, the most stringent will be followed.

4.4.1. Detailed HSE requirements shall be set forth in the contract and address the requirements of Attachment A. Among the provisions in the contract are the following key requirements.

- A Hazard Assessment Safety Action Plan, specific to their scope of work that has been generated by each subcontractor prior to mobilizing on the project. This Plan will be reviewed by the Company HSE Department representative.
- A project-specific emergency action plan in accordance with regulatory, client, and company requirements.
- Daily task-specific safety planning in the form of SPAs or JSAs.
- Participation by all subcontract personnel in Safety Observation Report (SOR) program.
- Completion of a Monthly Subcontractor Accident Statistics Report for each month in which they conduct work on the project.
- Responsibility for, and compliance with, all regulatory accident reporting and recordkeeping requirements for their employees.
- Prompt notification to Site Management of any accidents occurring on the project. Serious injuries, illnesses, or any accident involving a third party or a member of the public must be reported to Site Management immediately.
- Immediate notification to Site Management of any regulatory agencies' actions involving the subcontractor's work.

4.4.2. Before beginning work, selected subcontractors and their lower-tier subcontractors are to provide site management

- A copy of their HSE Program, and
- A copy of their Hazard Communication Program, if a US contractor.

4.4.3. Attachment A shall be reviewed during kick-off meetings, readiness reviews, etc. so that subcontractor personnel are reminded of what is expected.

4.4.4. Site management shall monitor contractor compliance with HSE requirements throughout the contract's life. The Contracts Management Group shall be notified of any issues or outstanding performance with a specific contractor to feed into evaluation of prospective subcontractors for future projects.

5.0 REFERENCES AND RELATED DOCUMENTS

Attachment A, HSE Requirements for US Contractors

Jacobs Subcontractor Injury Performance Standard

Applicant Contractor HSE Rating Worksheet

Attachment A, HSE Requirements for Subcontractors in Canada

Subcontractor Prequalification Evaluation Form For Canadian Operations

Subcontractor Prequalification Evaluation Guidelines for Canadian Operations

Contractor Risk Mitigation Plan for Canadian Operations

Attachment A

Jacobs
Health, Safety, and Environment Requirements
For US Subcontractors

Revision 8

October 2008

Health, Safety, and Environment Requirements For US Subcontractors

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1.0 SUBCONTRACTOR HEALTH, SAFETY AND ENVIRONMENT REQUIREMENTS

It is the policy of Jacobs, hereafter referred to as "Contractor", to select, contract with, and oversee Subcontractors with the same priority and emphasis on Health, Safety and Environment (HSE) protection as we practice for our own employees. It is a contractual requirement that Subcontractors comply with all applicable contractor, client, State, and Federal health, safety, and environmental regulations.

This Attachment specifies Contractor's HSE requirements that may exceed OSHA standards or the Subcontractors' normal HSE procedures. Subcontractors are responsible for reviewing and implementing the HSE requirements set forth in this Attachment, the Project Hazard Assessment and Safety Action Plan (HASAP), and Jacobs Health Safety and Environmental Procedures (HSEPs). Subcontractors are also responsible for ensuring that their lower tier subcontractors review and implement these HSE requirements.

2.0 DEFINITIONS

Accident/Incident	An unplanned, undesirable event that disrupts work activity.
Contractor	Jacobs Engineering Group or the Jacobs operating group or subsidiary company named in this contract in which these Subcontractor HSE requirements are incorporated.
Safe Plan of Action (SPA)	A task-specific planning document used to help ensure that every task receives proper HSE assessment and planning. Also referred to as a Job Safety Analysis (JSA) in some locations.
Subcontractor	The party, including "subconsultants", defined in the subcontract with Contractor for which these subcontractor Health, Safety, and Environmental Requirements are incorporated. Subcontractor Health, Safety, and Environmental Requirements shall extend to and govern Subcontractor's subcontractors, vendors, employees, and others under its direction or control.
Site/Project Management	The highest-ranking Contractor representative whose regular work location/office is at the project site.
Task Safety Awareness (TSA)	A review of the SPA among the crew and supervisor to discuss and resolve any HSE issues before work is continued, when there has been a break in the work schedule, change in work conditions, change in crew, etc.
Work	The total of the Subcontractor's responsibilities as set forth in the Subcontract Documents.

3.0 DOCUMENTATION AND REPORTING REQUIREMENTS

3.1. Before mobilizing to the project, the Subcontractor and its lower-tier subcontractors shall forward to the Contractor Site/Project Management a copy of their company's HSE Program.

3.2. Subcontractors must submit the information required by Exhibit 1, Subcontractor HSE Data Form, before award of subcontract, unless specifically exempted from this provision by the Contractor.

3.3. A project-specific HSE Plan or, in the case of hazardous waste operations, an HSP (see paragraph 3.4), must be generated by each Subcontractor mobilizing on the project. This plan must include a project-specific Emergency Response Action Plan in accordance with Contractor, Client, State, and Federal requirements.

3.4. If the project is regulated as a hazardous waste or emergency response operation, as defined in 29CFR 1926.65 or 29CFR 1910.120, then the Subcontractor has the choice of adopting the site Heath and Safety Plan (HSP) or developing a similar plan that is, at a minimum, equally protective and compliant. Subcontractor site personnel shall read and acknowledge by signature that they will comply with the applicable HSP.

3.5. Subcontractor shall furnish to the Contactor the names and qualifications of the Competent Persons and Qualified Persons, who may be required for their scope of work by the contractor's safety procedures and by Federal, State, or local regulations. Examples include Competent Persons and/or Qualified Persons for steel erection, excavation, scaffold erection, confined space entry, crane and rigging operations, annual crane inspections, fall protection, including horizontal lifeline systems,[1] etc.

3.6. Subcontractors are responsible for maintaining a First Aid Register (Exhibit 10) for all employee injuries and illness reported on the project.

3.7. Subcontractors must immediately inform the Contractor Site/Project Management of any OSHA, EPA, or other HSE regulatory agencies' inspections or other actions involving the Subcontractor's work.

3.8. Subcontractor employees must promptly report all potentially work-related incidents, injuries, or illnesses to their Supervisor or their Site HSE Representative.

3.9. Subcontractor must promptly report all potentially work-related incidents, injuries, or illnesses to the Contractor Site/Project Management or Contractor Site HSE Representative, after the appropriate level of medical assistance has been arranged.

3.10. Injuries, illnesses, or any incident involving a third party or a member of the general public must be promptly reported to the Site/Project Management.

3.11. Incidents involving potential exposures to hazardous materials and releases or spills of such materials must be promptly reported to the Site/Project Management.

3.12. Accident investigation reports for all Subcontractor accidents, injuries, and work-related illnesses shall be forwarded to the Site/Project Management within twenty-four hours of the occurrence.

3.13. Subcontractor employees are required to participate in documented, daily task-specific Safe Plans of Action (Exhibit 6) and regular Safety Observation Reports (Exhibit 7).

3.14. Subcontractors will conduct weekly HSE meetings, and signed copies of the meeting reports shall be made available to the Contractor upon request.

3.15. Subcontractors shall complete the Monthly Subcontractors Accident Statistics Report (Exhibit 2) for each month in which they conduct work on the project. These reports are due to the Contractor by the first business day of the month for the proceeding month.

4.0 HSE TRAINING/COMMUNICATION REQUIREMENTS

4.1. Subcontract employees must complete HSE training required by applicable Contractor, Client, State, and Federal HSE requirements. Such training may include, but is not limited to, a site-specific orientation and quiz provided by the Contractor, OSHA 10-Hour Construction Safety & Health Outreach Program, Safety Leadership Training for Supervisory Personnel, ergonomics training, and crane and rigging training. Documentation of all HSE training shall be maintained at the project site by the Subcontractor and provided to the Contractor upon request.

4.2. Workers involved with hazardous waste operations, as defined by 29 CFR 1910.120 or equivalent applicable State regulations, shall have met, prior to any field work activity or exposure, the training requirements of the standard. Certification of individual worker training shall be provided to Contractor prior to commencing work.

4.3. Subcontractors must certify that all operators of mobile equipment such as forklifts, cranes, aerial/boom lifts, buses, etc., have been trained and/or certified on the proper operation of the equipment. Mobile crane operators must be qualified on each crane (model, type, and rating) that they are assigned to operate through a testing and qualification procedure recognized by Contractor. Subcontractor will furnish qualified lift

[1] Added "horizontal lifeline systems," to paragraph 3.5.

supervisors that directly oversee the crane and associated rigging crews. Copies of their training and certification shall be maintained on the project site by the subcontractor and forwarded to the contractor upon request.

4.4. Subcontractors must establish a prompt and effective method of providing HSE communications such as HSE alerts, advisories, bulletins, regulatory updates, etc., to all site employees.

5.0 BASIC HSE REQUIREMENTS

The following HSE rules list Contractor's fundamental requirements for Subcontractor HSE. When there are multiple rules that may apply, the most stringent Contractor, Client, State, or Federal HSE regulations that govern the work shall be followed.

5.1. Each Subcontractor shall appoint an on-site HSE representative, who will attend regular Contractor HSE meetings and be responsible for implementation of the rules listed below, as well as other HSE rules determined, by the Contractor, to be necessary for the safe execution of the project. Subcontractors employing 35 or more workers, including their lower tier subcontract employees, must provide a full-time site HSE professional. Additional site HSE personnel are required for each additional 50 workers thereafter. Contractor shall determine appropriate qualifications for Subcontractor HSE personnel, based on project demands.

5.2. Hard hats (ANSI Z89.1 or equivalent) shall be worn at all times where overhead hazards exist (e.g. construction, environmental operations, operations or maintenance environment), regardless of the workers activities. This includes welders when using welding hoods.

5.3. Shirts with at least four-inch sleeves shall be worn at all times. No tank tops are allowed. Loose or frayed clothing, loose or hanging long hair, ties, rings, body jewelry, etc. shall not be worn around moving machinery or other areas where they may become tangled.

5.4. Hearing protection shall be worn when exposures exceed 85 DBA.

5.5. Hard-toe footwear (ASTM F2413, or equivalent) shall be worn by all workers when in the construction environment or in areas where there is a danger of foot injuries due to falling, rolling, or piercing objects or when employee's feet are exposed to electrical hazards.

5.6. Safety glasses with rigid side shields (ANSI Z87.1, or equivalent) shall be worn at all times when in the construction environment and in any area where eye hazards exist. This includes under welding hoods and for workers with prescription eye wear. Safety goggles may be worn over non-safety prescription eyewear.

5.7. Face shields must be worn in addition to safety glasses when grinding, chipping, jack hammering, and power sawing or when conducting other tasks that involve such face and/or eye hazards.

5.8. Gloves, appropriate for the hazard present, shall be worn when hands are exposed to absorption of harmful substances, cuts, abrasions, punctures, biological hazards, chemical burns, thermal burns, or harmful temperature extremes.

5.9. Subcontractor shall comply with the Contractor's 100% Fall Protection Policy. This policy states that "anytime employees are working from an unprotected elevation of six feet or more, fall protection must be used." Working as stated above means while traveling, stationary, or at anytime exposed to a fall from a surface not protected by approved handrails, guardrails or some other approved fall elimination device. Jacobs prohibits the use of positioning devices as the sole means of fall protection when working above six feet. Positioning device means a body belt or body harness system rigged to allow a worker to be supported on an elevated vertical surface, such as a wall, and work with both hands free.

5.10. The use of “passive” systems, such as safety nets, monitoring systems, or controlled access zones, as the sole means of fall protection when working above six feet, is prohibited. Jacobs prohibits the use of safety nets as an independent means of fall protection.

5.11. Workers in mechanical lifts, including scissor lifts, boom trucks, suspended or supported personnel baskets, articulating lifts, and other similar devices must use fall protection equipment at all times. Handrails on lifts may only be used for fall protection anchor points if approved by a Qualified Person. Such devices shall not be used as elevators to transport workers to different work locations.

5.12. All portable ladders must be clearly marked with the ladder owner’s name.

5.13. The safest means of worker access for overhead work (e.g., rolling scaffolds, mechanical lifts, platform ladders, etc.) shall be considered as alternatives to the use of portable ladders. If ladders are used, then the top of all straight and extension ladders shall be tied to a substantial anchor point before use; a second worker must hold the ladder until the tie-off is secure. And, if a worker’s feet are on or above the fifth rung of a stepladder, the top of the ladder must be tied to a substantial anchor or a second worker must hold the ladder throughout the task.

5.14. When ascending or descending a portable ladder, three-point contact is considered acceptable fall protection for fall exposures of less than 20 feet. When potential fall exposure exceeds 20 feet, personnel on ladders must be protected with a personal fall arrest system.

5.15. Decking sections shall be laid tightly and immediately secured upon placement to prevent accidental movement. During initial placement, decking sections shall be placed in such a manner to ensure full support by structural members and each piece shall be individually secured. Pre-installation or shake-out of multiple sections of decking using temporary methods of attachment, such as tack welding, is not allowed. The use of controlled decking zones is not allowed.

5.16. Work over or adjacent to water requires a specific safe work plan which must be approved by the Contractor before work begins. This includes, but is not limited to, rivers, lakes, canals, settlement ponds, and open tanks containing liquids. United States Coast Guard-approved Personal Flotation Devices (PFDs) must be worn when working over or adjacent to water. When working over water or adjacent to water without 100% fall protection, PFDs that will provide an unconscious user floatation in a face-up position must be used. Personnel shall not work over water alone.

5.17. Equipment and tools shall not be altered in any way to adapt it for a job for which the manufacturer does not intend it. The manufacturer of the equipment must approve any such adaptations or alterations to equipment in writing. Only trained and authorized persons shall operate machinery or equipment.

5.18. All hand-held power tools must be equipped with constant pressure switches that will automatically shut off power when the pressure (worker’s hand) is removed. Hand-held power tools with on/off or lock-on switches are not allowed.

5.19. Ground Fault Circuit Interrupters shall be used to protect all temporary electrical wiring and cord sets. The use of assured grounding (quarterly equipment inspections) in lieu of GFCIs is not an option.

5.20. Lock-out/tag-out procedures shall be followed to minimize the potential exposure of workers to hazardous energy. Hazardous pipelines or vessels will be isolated by using a double block and bleed system or by blanking. Every effort must be made to de-energize electrical equipment to be worked on and other electrical equipment in the area that may affect the work. If the equipment cannot be isolated or de-energized, written approval must be obtained from the Contractor’s Site Manager and Operations Manager before work proceeds. Only “Qualified Electricians” may work on energized or potentially

energized circuits. See 29 CFR 1910.332 for qualified electrician requirements. Jacobs considers equipment rated at 480 volts and above as "high voltage."

5.21. Subcontractor shall comply with the provisions of NFPA 70E, "Standard for Electrical Safety in the Workplace." Subcontractors shall ensure that their employees are trained in safe work practices, and that they are qualified, and that they are provided equipment, tools, and PPE that are specified in NFPA 70E.

5.22. Confined space entry work must follow a documented hazard assessment and safe work planning process, which must be submitted to the Contractor for review prior to entry.

5.23. High-visibility reflective safety apparel/vests (ANSI/ISEA 107, Class 2, or equivalent) must be worn by all personnel, who work on or near active highways, roads, or parking lots. Vests are also required for other work that places personnel, such as flaggers, riggers, survey crews, etc., near mobile equipment.[2]

Also, it is recommended that high visibility reflective safety apparel/vests be worn by all workers in the construction environment. The project-specific HASAP shall clearly define this PPE requirement.[3]

5.24. Motor vehicles and mobile equipment shall never be left running without an operator at the controls. Proper use of seatbelts by all occupants is mandatory. Motor vehicle operators are prohibited from using a mobile phone or two-way radio. This applies to both hands-free and non-hands-free devices. If the use of such a device by the motor vehicle operator is necessary, it is only allowed when the motor vehicle is stationary and in a safe location off the roadway. If required by the client, the use of two-way radios is allowed, provided that written approval by the relevant Jacobs Group Vice President is obtained and only while on a project location or within a client facility.

5.25. For movement of mobile equipment in congested areas, a designated flag-person shall be in full view of the operator and shall direct the movement. In some cases, multiple flag-persons may be required.[4]

5.26. The following are defined as "critical lifts" and require written approval from Contractor senior management. Mobile lifts:

- over 50 tons,
- exceeding 85% of the crane's capacity,
- involving more than one crane,
- of a non-rigid object,
- over active work areas,
- in active process facilities,
- over pipelines,
- near power lines or public property, or
- in confined or tight work areas.[5]

5.27. All outriggers on mobile cranes must be fully extended and fully deployed when the crane is used to lift or support a load. If, due to configuration or physical location, all outriggers cannot be fully deployed, calculations must be made from the "on-rubber" section of the

[2] Changed "motor vehicle" to "mobile equipment."
[3] New paragraph.
[4] New paragraph.
[5] Expanded list of examples of critical lifts.

load chart. On-rubber lifts and pick-and-carry operations require Contractor Site Manager's written approval.

5.28. Anti two-block devices that automatically disengage crane hoist/boom functions when the hook or block approaches the jib or boom tip are required on all cranes.

5.29. Multiple lift rigging (Christmas tree lifts) is not allowed without written approval by the Contractor's Senior HSE Manager and a written site-specific plan to prevent exposure to overhead loads during such lifts.

5.30. All skid-steer style loaders shall be fitted with a manufacturer-approved safety glass front door, front cage cover of equivalent effectiveness, or other device designed to keep the operator's hands and arms inside the protective cage. Operators are also required to use a manufacturer-approved shoulder harness.[6]

5.31. Smoking is allowed only in designated smoking areas that have been approved by Contractor.

6.0 CERTIFICATION, INSPECTIONS, AND REGULATORY AGENCY PERMITS

6.1. Certain operations may require a client and/or owner permit. Such activities may include but are not limited to hot work, confined space/vessel entry, excavations, asbestos abatement, lead abatement, etc. The Subcontractor representative shall ask Contractor Site/Project Management whether any parts of the Subcontractor's activities require a client and/or owner permit.

6.2. Some states and local authorities require permits for specific activities such as excavations, heavy lifts, asbestos/lead abatement, air permits, water permits, hazardous waste generation, etc. Subcontractors are responsible to secure and comply with these permits, unless Site/Project Management has delegated this responsibility to others in writing.

6.3. A third-party certified Competent Person shall make a thorough annual inspection of all cranes and powered hoisting equipment. Cranes assembled on site shall receive an annual inspection prior to being put into service. Documentation of all crane inspections shall be provided to the Contractor and must be maintained on site by the Subcontractor.

6.4. All scaffolding must be inspected and tagged by a Competent Person prior to initial use, before each work shift, and after any event that could affect its structural integrity. Suspended scaffolds must receive documented daily pre-use inspections. Untagged scaffolds must not be used.

6.5. Mobile equipment must receive daily pre-use inspections, which will be documented. Examples include forklifts, backhoes, personnel lifts/manlifts, etc.

7.0 HAZARDOUS CHEMICALS

7.1. Subcontractors shall include planning for environmental compliance in the preparation of their HSP or HSE Action Plan. Issues to be considered include but are not limited to release reporting, air permits, water permits, asbestos/lead permits or notifications, hazardous waste generation and related disposal procedures, spill mitigation and clean up methods, etc.

7.2. Subcontractor shall have a written Hazard Communication Program and comply with the requirements of that program. A copy of the program shall be forwarded to Site/Project Management prior to mobilization and a copy shall be in the possession of the Subcontractor on the site.

7.3. Any potentially hazardous material or chemical brought onto the site shall be accompanied by a Material Safety Data Sheet (MSDS). Copies of MSDSs shall be forwarded to the Site/Project Management before the product is brought onto the site.

[6] New paragraph.

Some sites, such as FDA regulated facilities, do not permit the use of chemicals that are not on a pre-approved list.

7.4. Small quantities (less than 10 gallons) of hazardous liquids, such as gasoline, diesel fuels, and solvents, brought onto the site shall be stored in a properly labeled safety container with a flame arrestor and self-closing lid.

7.5. Site/Project Management shall be notified before any chemical or material is used that could create foul smelling, noxious, or toxic vapors or gasses.

7.6. All accidents involving exposure to potentially hazardous materials and hazardous material releases (as defined by EPA-RCRA) must be immediately reported to the Contractor Site/Project Management. It is important to report all releases or exposures even though the incident may be considered minor or no adverse health effects or symptoms are apparent at the time.

8.0 RESPIRATORY PROTECTION

Subcontractors, who plan to use respirators as a part of their work operations, are required to forward to Site/Project Management a copy of their written Respiratory Protection Program. Refer to 29 CFR 1910.134.

9.0 HSE SURVEYS

Site/Project Management and the Contractor HSE Department shall conduct periodic HSE surveys of the site. Any HSE discrepancy observed shall be reported to the appropriate Subcontractor representative for immediate correction.

These HSE surveys do not relieve Subcontractors of their responsibility to self-inspect their work and equipment and to conduct their work in a safe and environmentally compliant manner.

10.0 PLANNING AND OBSERVATION PROCEDURES

In order to achieve the Contractor's goal of Zero Incidents, the following shall be implemented by the Subcontractor.

The SPA, the TSA, and the SOR process require each worker to receive on-the-job training from their direct Supervisor. Subcontractor employees shall also be trained and educated on their individual responsibilities contained in these tools by Contractor after mobilization.

10.1. Safe Plan of Action

The Safe Plan of Action (SPA) is developed by the crew assigned to perform the work with guidance from their Supervisor. (See Exhibit 6.) The Supervisor identifies the work area and task to be performed and then leads the crew in developing a Safe Plan of Action.

Creating the SPA requires the Supervisor to solicit crew participation in identifying hazards and hazard control measures such as PPE, training requirement, permits, procedures, etc.

Members of the team are required to sign the SPA document to indicate their participation, their understanding of the plan, and their agreement to follow the plan.

10.2. Task Safety Awareness

The Task Safety Awareness (TSA) meeting is a daily HSE briefing associated with the task(s) that are scheduled for the crew during the work shift.

These meetings generally take from two to ten minutes and address the HSE measures specific to the tasks.

TSA meetings shall be conducted at least daily and whenever a task presents a change of hazards from the previous tasks.

10.3. Safety Observation Reports

The Safety Observation Report (SOR), Exhibit 7, is a proactive process designed to identify and document HSE-related acts and conditions in the work environment. All Subcontractor's supervisors are required to participate in the SOR process by generating written SORs and turning them in to the Contractor Site/Project Management at least weekly.

The SOR allows any site worker to record observed proper or improper HSE practices and identifies the cause of any deficiencies so that corrective action can be taken.

11.0 ACCIDENT/INCIDENT INVESTIGATION

A formal accident investigation must be conducted when an accident occurs, including non-injury incidents, most first-aid type accidents, and environmental releases or spills.

11.1. In the event of a workplace accident, injury, or illness, the most important immediate actions are to provide medical assistance to those who may need it and to ensure the safety of others that may be affected or acting as emergency responders.

11.2. Securing the accident scene is essential to ensure an effective accident investigation. No materials or equipment shall be moved made until a review of the accident is completed, except when securing equipment or materials that could result in further injury.

11.3. Obtain witnesses' names, permanent addresses, and signed statements of their complete factual observations. (See Exhibit 9.)

11.4. All accident investigations must be documented using the Accident Investigation Report (Exhibit 8). All required reports should be completed and copies provided within 24 hours to the Contractor Site/Project Manager.

12.0 DRUGS, ALCOHOL, AND CONTRABAND

The Contractor strictly prohibits the use, sale, attempted sale, manufacture, possession, distribution, cultivation, transfer, or dispensing of any illicit substance. This includes the use or possession of prescription medications without a valid prescription.

Subcontractors shall implement a Drug, Alcohol, and Contraband Policy, including post incident testing, which meets the requirements of the Contractor's policy. Key elements of the Contractor's policy, except where prohibited by law, are:

- Pre-access/Pre-assignment testing current to within six months prior to initial assignment to work on the Contractor's project.
- Post-incident testing of any worker involved in a project-related workplace incident that results, or could have resulted, in
    - injury to any person requiring medical treatment beyond first aid,
    - any type of medical attention given by a third-party medical services provider (hospital, clinic, doctor, etc.),
    - a motor vehicle incident, or
    - property damage.

    Post-incident testing must be conducted as soon as possible after the incident occurs.
- Reasonable suspicion testing upon reasonable suspicion by Contractor or subcontractor management that a worker is under the influence of a prohibited substance. In such cases, worker(s) shall be immediately removed from the project and surrender their project credentials. Personnel so removed may only be allowed to return with a negative test result and written permission of the Contractor.

- Periodic random or unannounced testing for workers randomly selected or chosen by job classification or worksite. The percentage of the workforce, or the number of workers, selected for testing shall be specified on a project specific basis and stated in the project's Hazard Assessment Safety Action Plan.

Possession or use of alcohol in a Contractor-, client-, or subcontractor-provided vehicle is prohibited.

Any worker whose drug or alcohol test is positive will be removed from the project and required to surrender their project credentials.

Refusal to submit to drug or alcohol testing, or attempts to tamper with, adulterate, dilute, or otherwise tamper with a test sample will be treated the same as a positive test result.

Subcontractor shall adopt collection, chain-of-custody, and other related procedures consistent with sound industry practice.

The owner's (client's) drug and alcohol testing requirements may be more stringent than the Contractor minimums. If so, the owner's requirements shall be enforced.

If the Contractor suspects that a worker is in possession of illegal drugs, alcohol, or contraband, the Contractor may request the individual to submit to a search of his or her person, personal effects, vehicles, lockers, and baggage. The Contractor may also conduct random searches of individuals entering or leaving the work site. Any suspected contraband will be confiscated and may be turned over to law enforcement, as appropriate. If an individual is asked to submit to a search and refuses, that individual will be considered insubordinate, will surrender their project credentials, will be escorted off the job, and will not be allowed to return.

Contractor shall have the right to review the subcontractor's Drug, Alcohol, and Contraband Policy and to audit the subcontractor's implementation of their program at the jobsite.

Subcontractors shall comply with all applicable federal, state, and local alcohol and drug-related laws and regulations.

13.0 MEDICAL AND EXPOSURE MONITORING

Subcontractors involved with operations, such as those involving hazardous waste, asbestos or lead abatement, certain carcinogenic compounds, etc., shall describe their medical and exposure monitoring procedures and their proposed compliance methods in their HSE Action Plan or HSP.

Employees involved in these operations shall have met, prior to any fieldwork activity or exposure, the medical requirements of applicable regulations or standards, including, but not limited to, a baseline medical exam and periodic update exams, as required.

Employee medical requirements and limitations shall be considered prior to the use of certain types of PPE, such as respirators.

14.0 IMMINENT DANGER SITUATIONS

Upon discovery of any situation that may, in the opinion of the Contractor, reasonably be expected to cause serious physical harm, illness, death, or significant environmental damage, the Subcontractor Site/Project Management or HSE representative shall suspend the related work immediately. Work may resume only after the HSE concern(s) have been corrected, to the satisfaction of the Contractor. Examples of "imminent danger" situations may include, but are not limited to the following:

- Falls from elevations
- Excavations not properly sloped or shored
- Electrocution hazards
- Work activities posing injury hazards to the general public
- Operation of vehicles, machinery or heavy equipment in an unsafe manner

- Improper Lock Out/Tag Out procedures

In addition to the immediate suspension of work, the procedure for correction of imminent danger situations follows the "HSE Adherence Policy" set forth below.

15.0 HSE ADHERENCE POLICY

Subcontractors are required to comply with the applicable HSE requirements and regulations. The procedures below outline a three-step, progressively administered system to correct compliance problems. However, if in the opinion of the Contractor, non-compliance issues are considered to be severe, Subcontractors' contracts may be terminated at any time.

15.1. Action Level One

If a Subcontractor fails to comply with an applicable HSE standard, Site/Project Management will issue a written "Notice of HSE Non-Compliance" (Exhibit 3) to the Subcontractor's site representative. Site/Project Management will also forward a "Warning Letter for HSE Non-Compliance" (Exhibit 4) and a copy of the Notice of HSE Non-Compliance to the Subcontractor's President or Operations Manager. Copies of these documents shall be forwarded to the Jacobs Operations and HSE Managers.

15.2. Action Level Two

If item(s) of HSE non-compliance are not corrected by Action Level One, or if the Subcontractor repeatedly fails to comply with the applicable HSE regulations, the Site/Project Manager will issue a "Written Notice of Temporary Job Suspension" (Exhibit 5) to the Subcontractor. The Subcontractor's work may not resume until the Contractor Operations Manager and the Subcontractor's Division Manager or equivalent have met and the Subcontractor has proposed corrective actions that are acceptable to the Contractor. Actions that may be considered include, but are not limited to:

- Removal of certain Subcontractor personnel from the project,
- Alteration of the Subcontractor's job procedures, or
- Implementation of corrective action by the Contractor with back charges to the Subcontractor.

The Subcontractor shall not resume work until the Contractor's Operations Management accepts the proposed corrective actions. Contractor Operations Management will document and keep on file the meeting results in the form of meeting minutes.

15.3. Action Level Three

If Action Levels One and Two do not result in the Subcontractor's HSE performance being brought into compliance, subcontract termination may result. Contractor Operations Management may terminate the subcontract after verifying with the Site/Project Management that the HSE adherence procedure has been followed and after giving the Subcontractor applicable notice. Subcontractors that have a contract terminated in accordance with this procedure are ineligible to participate in future Contractor projects until they have implemented and demonstrated corrective actions to improve their deficiencies. Only written approval from the Contractor's Director of Operations can reinstate a Subcontractor's eligibility.

16.0 EXHIBITS

Exhibit 1, Subcontractor HSE Data Form

Exhibit 2, Monthly Subcontractor HSE Statistics Report

Exhibit 3, Notice of HSE Non-Compliance

Exhibit 4, Warning Letter for HSE Non-Compliance

Exhibit 5, Written Notice of Temporary Job Suspension

Exhibit 6, Safe Plan of Action

Exhibit 7, Safety Observation Report

Exhibit 8, Accident/Incident Investigation Report

Exhibit 9, Witness Statement

Exhibit 10, First Aid Register

Exhibit 1 — Subcontractor HSE Data Form

Provide HSE Performance History For Last Three Full Years

Enter Year	20__	20__	20__
Workers Compensation Experience Modification Rate (EMR)			
If self insured, provide employee work hours per claim			
Number of employee hours worked			
Number of fatalities (Column G on OSHA Form 300; provide explanation on separate sheet for each fatality)			
Number of cases involving days away from work (Column H on OSHA Form 300)			
Number of job transfer or restricted duty cases (Column I on OSHA Form 300)			
Number of "other recordable cases" (Column J on OSHA Form 300)			
Total of all cases above (fatalities, days away from work, transfers or restricted duty, and other recordable cases, i.e., the total of Columns G, H, I, and J)			
OSHA Incidence Rate (total recordable cases x 200,000/total work hours)			
Number of citations by OSHA and other HSE regulatory agencies (provide details for each on a separate sheet)			
Number of miles driven on company business			
Number of motor vehicle accidents			
Miles driven divided by number of vehicle accidents			

HSE Program

	Yes	No
Do you have a written hazard communication program?		
Do you have a written HSE program?		
Do you have a written drug and alcohol abuse prevention program, which includes pre-employment, reasonable suspicion, and post incident testing?		
Do you have a written respiratory protection program?		
Do you have a new employee orientation program? If yes, does it contain instructions on:		

	Yes	No
• Company HSE Policy		
• Company HSE Record		
• Company HSE Rules		
• Driving Safety		
• Electrical Safety		
• Fall Protection		
• Fire Protection		
• First Aid		
• Hazard Recognition		
• Hazard Reporting		
• Hearing Conservation		
• Housekeeping		
• HSE Meeting Attendance		
• Injury Reporting		
• Ladders and Stairway Safety		
• Lock-out/Tag-out		
• Personnel Protective Equipment		
• Personnel Protective Equipment		
• Toxic Substances		
• Trenching and Excavation		
Do you have a training program for newly hired or promoted first line supervisors? If yes, does it contain instructions on:		
• Accident Investigation		
• Emergency Procedures		
• First Aid Procedures		
• Hazard Recognition		
• HSE Supervision		
• Incident Reporting		
• New Employee Orientation		
• Safe Work Practices		
• Tailgate/Toolbox HSE Meetings		
Supervisor HSE meetings are conducted:		
• Weekly		
• Bi-weekly		

	Yes	No
• Monthly		
• Less often, as needed		
Do you conduct field HSE inspections of work in progress?		
If yes, who conducts the inspections? _____		
How often? _____		
Are accident reports circulated to your management?		
Is HSE a (documented) weighted factor in evaluating in the performance of:		
• Foreman		
• Supervisor		
• Management		
Does your firm hold "Toolbox" HSE Meetings? If yes, how often:		
• Weekly		
• Bi-weekly		
• Monthly		
• Less often, as needed		

HSE Staff

	Number
How many full time HSE professionals do you have on staff?	
How many full time industrial hygienists do you have on staff?	
How many full time physicians do you have on staff?	

Who is the most senior staff HSE professional at your company?		
Name:	Title:	Phone:
Who should we contact to discuss the details of the information contained in this document?		
Name:	Title:	Phone:

Exhibit 2— Monthly Subcontractor HSE Statistics Report

For Exhibit 2, provide either

- the Subcontractor Safety Statistics Monthly Report Blank Form, which is the preferred format, or
- if the subcontractor does not have electronic capabilities, provide the Monthly Subcontractor Accident Statistics Report, so that requested information can be obtained in paper form, and include here as Exhibit 2 to Attachment A.

Exhibit 3 — Notice of HSE Non-Compliance

To:

Site Representative for:

Your company has been found to be in non-compliance with one or more Federal, State, or Contractor HSE requirement(s), as specified below. This HSE non-compliance must be corrected immediately for your company to meet the requirements of your subcontract.

Item No.	Description of Non-compliance	Applicable HSE Requirement

Issued By (Project Manager or Site Manager Issuing Notice):

Name Printed:	Title:
Signature:	Date:

Received By (Subcontractor Representative Receiving Notice):

Name Printed:	Title:
Signature:	Date:

cc: Contractor Operations Manager
HSE Representative

Exhibit 4 — Warning Letter for HSE Non-Compliance

Project Name:

Project Number:

Your firm, _____,

has been found to be in violation of your contract by non-compliance with applicable Federal, State, or Contractor HSE requirements.

On _____ (date),

in accordance with the Contractor Subcontractor HSE Adherence Policy, your representative, _____ _____,

was given a Notice of HSE Non-Compliance (copy attached). This notice specifies areas where your company does not comply with Federal, State, or Contractor HSE requirements, and requests that these items be corrected immediately.

If they are not corrected, more stringent measures will be taken in accordance with Jacobs Subcontractor HSE Adherence Policy.

Your prompt attention to this matter will be appreciated.

Issued By (Project Manager or Site Manager Issuing Warning Letter):

Name Printed:	Title:
Signature:	Date:

Received By (Subcontractor Representative Receiving Warning Letter):

Name Printed:	Title:
Signature:	Date:

cc: Contractor Operations Manager
HSE Manager

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Exhibit 5 — Written Notice of Temporary Job Suspension

Your company, _____

while working on the _____

project has been notified of HSE performance deficiencies in accordance with Jacobs' Subcontractor HSE Adherence Policy.

Despite these written notifications requesting that immediate corrective action be taken to improve your HSE performance, improvement has not occurred.

Therefore, in accordance with Action Level Two of the Subcontractor HSE Adherence Policy, we are hereby notifying you that after securing your equipment, all job activities on the project named above are to cease.

Activities on this project may be resumed only after your company meets requirements set forth in the Subcontractor HSE Adherence Policy.

Issued By:

Name Printed:	Title:
Signature:	Date:

cc: Group Vice President
Operations Manager
HSE Manager

Exhibit 6 — Safe Plan of Action

Print side one and side two of the SPA form found in HSEP 2.16, Safe Plan of Action and include here as Exhibit 6. The SPA form is found in HSEP 2.16 as HSEP 2.16f1, Safe Plan of Action Form.

Exhibit 7 — Safety Observation Report

Print the SOR form found in HSEP 2.17, Safety Observation Reports and include here as Exhibit 7.

Exhibit 8 — Accident/Incident Investigation Report

Print the Accident/Incident Investigation Report form found in HSEP 5.1, Accidents and Incidents as Figure 2 and include here as Exhibit 8.

Exhibit 9 — Witness Statement

Print the Witness Statement form found in HSEP 5.1, Accidents and Incidents as Figure 4 and include here as Exhibit 9.

Exhibit 10 — First Aid Register

Print the First Aid Register form found in HSEP 5.1, Accidents and Incidents as Figure 6 and include here as Exhibit 10.

Jacobs Subcontractor Injury Performance Standard

The Jacobs Subcontractor Injury Performance Standard (JSIPS) provides guidelines for evaluating subcontractor injury or illness performance as part of the Jacobs subcontractor pre-qualification process.

JSIPS utilizes the subcontractor's Experience Modification Rate (EMR) and the OSHA Total Recordable Incidence Rate (Incidence Rate) for the previous calendar year. Performance over the past three years shall also be evaluated and should indicate a general decline in these rates. Evaluation of the subcontractor's OSHA "Log of Work-Related Injuries and Illnesses" for types of injuries experienced shall be considered as well as the subcontractor's documentation procedures. Many subcontractors document preventable injuries that would otherwise not be recordable, due to a lack of understanding of the OSHA record keeping guidelines.

Subcontractors should, in turn, be encouraged to use JSIPS to qualify their lower-tier subcontractors who will be participating in Jacobs projects.

The following table provides Safety Performance Categories based on EMR and Incidence Rate ranges of acceptability. Based on performance, prospective subcontractors are classified into these categories. If a subcontractor falls into any category other than "Preferred", and for valid reasons this subcontractor must be considered, actions, as defined below, shall be taken.

Safety Performance Category	EMR	Incidence Rate As Percent Of NAICS/SIC
Preferred	< 0.8	0 – 25%
Acceptable	0.8 – 0.9	>25% <=50%
Exception	0.9 – 1.0	>50% <=75%
Conditional	0.9 – 1.0	>75% <=100%
Not Acceptable	> 1.0	>100%

Preferred Status Subcontractors

- Subcontractor is acceptable without further action.

Acceptable Status Subcontractors

- Written approval required by Project Manager, Site Manager, Project HSE Representative, and Owner (if necessary).
- Project team shall determine whether additional safety coverage is required in the field. Costs for additional safety coverage shall be considered in evaluating subcontractor's proposal.

Exception Status Subcontractors

- Same approvals as "Acceptable" status with the addition of local office HSE Manager.
- Project HSE Representative will review subcontractor's safety program and indicate corrective actions.
- Subcontractor shall present a written corrective action plan identifying specific actions and/or programs the subcontractor will implement at the job site to ensure compliance with the overall project safety goals and objectives. This plan will be review and approved by the local office HSE Manager, Project HSE Representative, Project Manager, Site Manager and Owner (if necessary).
- Project team shall provide additional safety coverage through additional training, audits, and inspections.

- Subcontractor's home office safety participation in the field is required.
- Costs for additional safety coverage shall be included in evaluating the subcontractor's proposal.

Conditional Status Subcontractors

Same requirements as "Exception" status with the addition of the following:

- Additional approvals are required by the construction manager & Reg. HSE Manager.
- Subcontractor shall provide at the site during the course of the work a dedicated qualified safety professional, who has been approved by the local office HSE Manager.

Not Acceptable Status Subcontractors

- Use of these subcontractors is strongly discouraged.
- Under normal conditions, subcontractors in this category are not permitted to bid or perform work directly for Jacobs, however, under extremely critical conditions as determined by the Project Manager, Site Manager, Construction Manager and Owner (if necessary), these subcontractors may be used.
- All requirements of Conditional Status Subcontractors shall apply with the additional approval of the Manager of Construction Relations.
- A full-time dedicated Jacobs HSE Representative will be assigned to this subcontractor during the course of the work.

Definitions

Experience Modification Rate (EMR) reflects the workers compensation claims history of an employer based on three years of experience, excluding the most recent year. The subcontractor's worker compensation insurance provider shall issue a letter that certifies the calculation of the employer-specific rate.

Incidence Rate refers to the OSHA record keeping rate established in the Code of Federal Regulations, Title 29, Part 1904. Incidence rates are provided through the Department of Labor using the Bureau of Labor Statistics. Incidence rate data, categorized by SIC code, may be obtained through the Internet at http://www.bls.gov/iif/oshwc/osh/os/ostb0880.pdf

SIC is a 4-digit Standard Industrial Classification Code from the 1987 SIC manual, which most closely applies to the type of work a subcontractor primarily performs.

North American Industry Classification System (NAICS) industries are identified by a 6-digit code, in contrast to the 4-digit SIC code. The longer code accommodates a larger number of sectors and allows more flexibility in designating sub-sectors. The system was developed by the U.S., Canada, and Mexico to provide comparable statistics throughout the three countries. It also provides for additional detail not necessarily appropriate for all three NAICS countries. NAICS is organized in a hierarchical structure, much like the existing SIC.

Applicant Contractor HSE Rating Worksheet

Applicant	Total Recordable Cases (Columns G, H, I, and J) Rates										Lost Workday Cases (Column H) Rates										EMRs				HSE Program	HSE Staff	Score (%)	Evaluation	Remarks
	20__			20__			20__			Grade	20__			20__			20__			Grade	20__	20__	20__	Grade					
	Rate	No.	Hrs.	Rate	No.	Hrs.	Rate	No.	Hrs.		Rate	No.	Hrs.	Rate	No.	Hrs.	Rate	No.	Hrs.		Rate	Rate	Rate						
Example 1	6.0	284	9,524,599	5.3	222	8,376,016	7.3	290	7,955,698	8	1.9	90	9,524,599	2.1	86	8,376,016	2.6	104	7,955,698	9	0.65	0.69	0.59	10	9	9	90	Acceptable	
Example 2	14.1	6	85,117	18.4	6	65,127	6.5	2	61,744	3	2.3	1	85,117	6.1	2	65,127	0.0	0	61,744	7	0.90	1.06	1.15	5	5	6	52	Marginal	
Example 3	25.8	11	85,117	30.7	10	65,127	16.2	5	61,744	1	7.0	3	85,117		3	65,127		3	61,744	1	1.50	1.40	1.60	1	5	6	28	Not Acceptable	
Applicant 1	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		
Applicant 2	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		
Applicant 3	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		
Applicant 4	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		
Applicant 5	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		
Applicant 6	#DIV/0!			#DIV/0!			#DIV/0!				#DIV/0!			#DIV/0!			#DIV/0!										0		

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HSE Procedure		Document No: HSEP 6.9	Page: 1 of 5
Warehouse Safety		Supersedes: HSEP 6.9	Revision: 3 Issue Date: 29 Jul 05
Issuing Department: Corporate HSE	Approval: Susan Kiesling@Jacobs.com	Previous Rev. & Issue Date: Rev. 2, 26 Jul 01	Effective Date: 29 Jul 05

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1.0 PURPOSE AND SCOPE

This HSEP provides the minimum procedures to be followed during warehouse activities. It applies to all Company employees, including all subsidiaries and on-site contractors involved in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

Supervisors responsible for employees performing work covered by this HSEP must:

- Confirm that each job has been properly evaluated for hazards and that these hazards have been properly eliminated or controlled.
- Ensure that employees are aware of any hazards associated with their work.
- Continuously monitor the work to assure compliance with this HSEP.

3.0 PROCEDURE

3.1. General Warehouse Requirements

Warehouses and other storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, slipping, fire, explosion, or pest harborage.

Aisles, stairways, walkways, and loading platforms shall also be kept free of such material.

Where vehicle access is provided, clearance signs shall be posted to warn of clearance limits. Vehicles shall additionally sound a horn prior to entering or exiting such warehouse(s).

Illumination provided within the warehouse shall be at an intensity of at least five foot-candles.

Warehouses located in remote areas shall have some form of communication for employee use in case of emergency.

3.2. Design

During the design and layout stages, consideration shall be given to the amount, weight, and height of material to be stored. Storage bins and shelves shall be constructed accordingly.

Maximum floor, shelf, and platform load limits shall be determined by authorized professional personnel. Floors, shelves, and platforms shall be marked with allowable load ratings. Load ratings shall not be exceeded.

When feasible, warehouse walkways and vehicle passageways shall be marked or striped to indicate such.

3.3. Shelf and Overhead Storage

Maximum safe load limits in pounds per square feet must be posted in storage areas buildings and structures except for floor or slab storage.

When heavy fittings or other objects are stored in bins, a strip or lip should be secured to the bottom of the bin to prevent such fittings or objects from falling-out when an object is removed.

Heavier material should be stored in lower sections of bins and shelves and the lighter material stored above.

Ladder or stairways must be provided for access and egress.

Proper equipment, e.g., stepladders, forklifts, shall be made available for employee's use when obtain materials from elevated storage areas.

Shelves, bins, and platforms shall be inspected on a periodic basis to ensure their stability.

A non-skid material shall be provided on ramp, step, and walking surfaces to prevent the possibility of slipping.

3.4. Floor Area Storage

Aisles and passageways must be kept clear for free and safe movement of material handling equipment.

Materials must not be placed within six feet of hoist way of floor openings nor within 10 feet of exterior walls which do not extend above the top of the material stored.

Non-compatible materials must be separated in storage.

Exits must not be obstructed and must be designated with exit signs.

Aisle space must be provided to accommodate the widest vehicle that may be used inside the building for fire fighting purposes. Aisle space for vehicles and/or employees shall meet all applicable Federal, state, county, and city adopted fire regulations.

The following clearance must be maintained:

- 36 inches from sprinkler deflectors
- 36 inches from fire door openings
- 24 inches around the path or travel of fire doors

3.5. Indoor Storage

Exits must not be obstructed.

Non-combustible material must be separated by a barrier having a one-hour fire resistive rating.

Aisle space must be provided to accommodate the widest vehicle that may be used inside the building for fire fighting purposes. Aisle space for vehicles and/or employees shall be consistent with fire regulations.

Maintain the following clearances:

- 36 inches from sprinkler deflectors,
- 36 inches from fire door openings, fire fighting equipment and safety showers, and
- 24 inches around the path of travel of fire doors.

3.6. Chemical Storage

Small quantities of flammable materials, such as aerosol cans containing flammable liquids, must be stored in an approved storage cabinet.

Large quantities of flammable and/or combustible materials shall be stored outdoors in an approved storage locker.

Highly volatile materials, such as gasoline, ether, etc., shall not be stored in the warehouse.

If corrosive and/or irritant products are stored in the warehouse, an eyewash and safety shower shall be provided in the warehouse near the stored chemicals.

If corrosive, irritant, or hazardous chemicals/materials are stored in warehouse, a comprehensive list of such chemicals and copies of Material Safety Data Sheets (or equivalent in countries outside the US) for all stored items must be maintained at the warehouse for reference and emergency purposes. Refer also to HSEP 1.3 for information related to the hazard communication program.

3.7. Fire Protection

Appropriate fire protection equipment shall be adequately located in the warehouse.

Fire extinguisher signs shall be posted next to portable fire extinguishers.

3.8. Exits

Doors used as exits shall be marked with an “Exit” sign of legible letters not less than six inches high with principal letter strokes of not less than three-fourths of an inch wide.

Exits and exit accesses shall be arranged such that they are readily accessible at all times.

All exit doors shall remain unlocked while warehouse is occupied.

3.9. Training

All personnel engaged in warehouse operations must be properly trained in the requirements of this HSEP.

3.10. Environmental

Stored materials should be kept dry at all times and away from direct sunlight to avoid degradation that can result in waste generation. Bagged materials should be maintained on pallets to avoid contact with a potentially damp floor.

Spills of material shall be cleaned up promptly. The spill area should be roped off immediately until the spilled material is removed. Forklifts and trucks should be kept out of the area in order to avoid picking up material on their tires and contaminating other areas.

Segregated storage areas must be provided for liquid products and proper spill containment employed. Containment may take the form of an in-floor trench or sump, elevated berm, or self-contained pallet. Drums should be routinely inspected for leakage.

Drums stored on pallets should be banded if they are to be stacked or placed on an elevated shelf.

Metal drums stored outside should be held in a covered area or have lid covers to prevent rusting and contamination caused by rain.

Dispensing drums should have locking spigots to prevent accidental opening. A collection bucket with absorbent pad should be placed under the spigot to collect drips.

An accurate inventory of partially used products must be maintained. These products must be stored (sealed container, free of trash, and label intact) in a manner to promote their continued use.

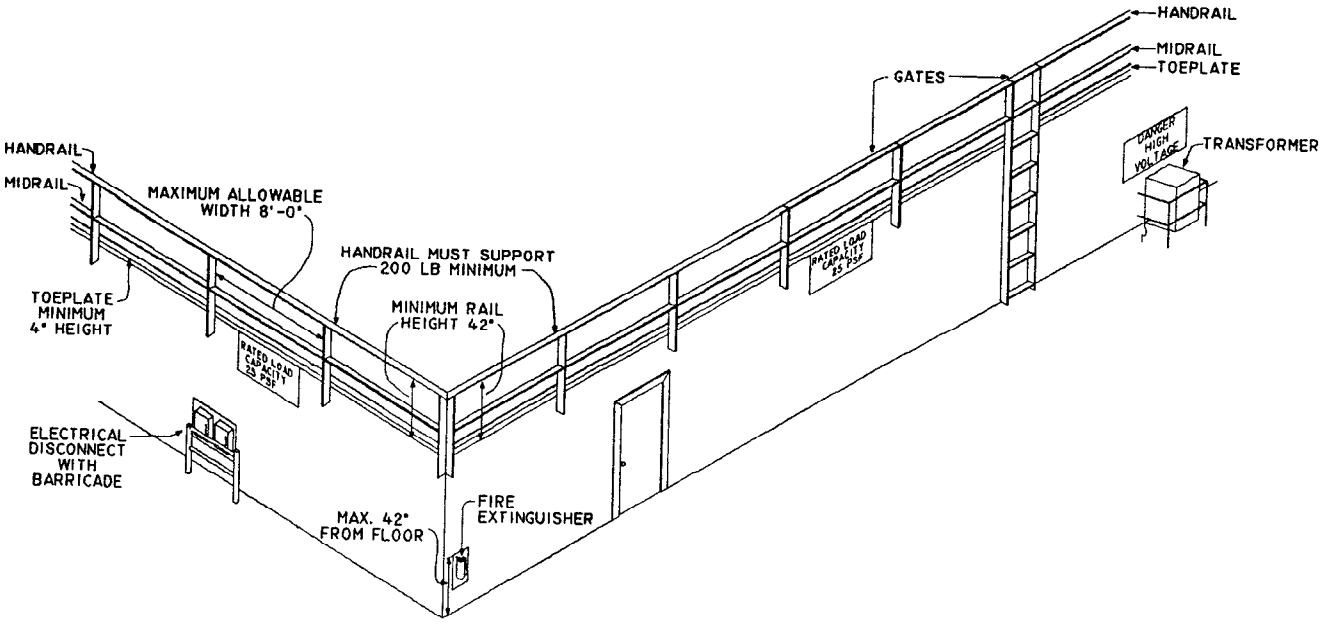
The storage of unusable or spoiled material can result in hazardous waste storage law violation and citation of if an inspector believes that storage is being used as an alternative to legal disposal.

4.0 FIGURES

Guidelines for Overhead Storage

Figure 1

Guidelines For Overhead Storage



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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety and Environment Procedure (HSEP) describes the procedures for cold stress monitoring of personnel engaged in field work activities.

This HSEP applies to all Company employees who perform field work in cold weather and who are at risk of developing cold stress.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

ECT Refers to equivalent chill temperature.

4.0 PROCEDURE

4.1. Hazards of Cold Environments

Frostbite and hypothermia are two types of cold injury, against which personnel must be protected during the performance of field activities. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 100°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature). As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident.

Since prolonged exposure to cold air, or to immersion in cold water at temperatures well above freezing, can lead to dangerous hypothermia, whole body protection must be provided.

Adequate insulating clothing to maintain core temperatures above 36°C (96.8°F) will be provided to workers. The equivalent chill temperature (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature) should be used when estimating the

combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

Core body temperatures of less than 96.8°F will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia.

4.2. Evaluation and Control

Environmental monitoring will be conducted when air temperatures are below 45ºF.

Workers with diseases or taking medication that interferes with normal body temperature regulation will be excluded from work when temperatures are 30ºF or below.

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur only at temperatures below -1°C (30°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Limits for properly clothed workers for periods of work at temperatures below freezing are shown in the table entitled Threshold Limit Values Work — Warm-up Schedule for Four-Hour Shift.

If available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7°C (20°F), heated warming shelters (tents, trailers, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure.

The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided.

A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

If workers are handling fluids which cool when they evaporate (gasoline, alcohol or cleaning fluids) precautions will be taken to avoid soaking clothing and skin contact.

For work practices at or below -12°C (100°F) ECT the following shall apply:

- The worker shall be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, test periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
- New employees shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
- The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used.

- The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:
  - Proper re-warming procedures and appropriate first aid treatment.
  - Proper clothing practices.
  - Proper eating and drinking habits.
  - Recognition of impending frostbite.
  - Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - Safe work practices.

5.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices

U.S. Army Corps of Engineering, Safety and Health Requirements Manual, October 1992

6.0 FIGURES

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

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Figure 1

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

(UNDER CALM CONDITIONS)

Estimated Wind Speed (in mph)	Actual Temperature Reading (F°)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (F°)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security	INCREASING DANGER Danger from freezing of exposed flesh within one minute.	GREAT DANGER Flesh may freeze within 30 seconds.

Trenchfoot and immersion foot may occur at any point on this chart.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1987-1988, Cincinnati, Ohio, 1987

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Figure 2

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work period	No. of Breaks	Max. Work Period	No. of Breaks
1. -26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min.	2	55 min.	3	40 min.	4
2. -29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
3. -32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
4. -35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
5. -38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
6. -40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
7. -43° & below	-45° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-1991, Cincinnati, Ohio, 1990.

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1.0 PURPOSE AND SCOPE

This Health Hazard Evaluation (HHE) procedure provides guidance in determining, documenting and prioritizing project level exposure monitoring, medical surveillance and training requirements for occupational health hazards.

An HHE is required at all locations where chemical hazards exist, including but not limited to refineries and chemical processing, packaging or handling facilities. For sites that use consumer use chemicals under routine conditions only, the HHE is required to state this. Under these conditions it is unlikely that industrial hygiene surveillance will be required.

The HHE is used to determine the need to conduct further industrial hygiene surveys and monitoring including integrated air sampling, noise dosimetry and other exposure assessments.

The HHE and Industrial Hygiene Surveillance Plan should be developed in conjunction with the project HASAP or HSP and can provide information in the preparation of SPAs and the hazard communication procedure, HSEP 1.3..

For chemically complex projects, client provided health hazard information shall be used to conduct an initial HHE during the preparation of the proposal. Once field activities begin, this initial HHE should be assessed by a Jacobs HSE professional with appropriate IH expertise and credentials and updated as required.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Project Manager

The Project Manager is responsible for assuring that the site-specific HASAP includes the project HHE, if applicable.

The Project Manager is also responsible for obtaining copies of historical client-specific or project-specific health and safety-related permits, environmental permits, and other work permits, which might contain useful health hazard related information.

2.2. Senior HSE Manager

The Senior HSE Manager is responsible for identifying chemically complex projects and coordination with Jacobs Sales and Business Development on new proposals involving chemically complex projects and projects involving regulated hazardous materials for input of HHE information.

2.3. Senior Industrial Hygiene Manager

The Senior Industrial Hygiene Manager provides technical support and guidance to the Regional HSE Manager in the development of the HHE. The Sr. IH Manager will also assist the Project Industrial Hygienist in development of the project level industrial hygiene surveillance plan to include; prioritizing monitoring, reporting findings, making recommendations for controls, tracking results and determining appropriate points to cease monitoring.

2.4. Regional HSE Manager

The Regional HSE Manager is responsible for the development of the HHE for new projects and for coordination with the Sr. Industrial Hygiene Manager in the preparation of the HHE on chemically complex projects and as needed on other projects.

The Regional HSE Manager is also responsible for ensuring routine review and consultation with the industrial hygiene manager is conducted and an industrial hygiene surveillance plan has been developed as necessary.

2.5. Project Industrial Hygienist

The Project Industrial Hygienist will coordinate with the Site HSE Supervisor and Industrial Hygiene Manager on implementing the IH surveillance plan. This will include performing worker monitoring, documentation of monitoring conditions and proper handling and control of samples

2.6. Site HSE Supervisor

The Site HSE Supervisor will implement the IH Surveillance Plan and will assist the Project Industrial Hygienist in worker monitoring. The Site HSE Supervisor will also utilize the findings and recommendations of worker monitoring to modify the HASAP or HSP and SPAs as necessary.

3.0 DEFINITIONS

Action Level (AL)	An airborne concentration of a contaminant, which is typically half the established exposure limit.
Chemically Complex Project	A project, activity, or operations location that may entail potentially elevated health or environmental risks based on the nature of the hazards involved (chemical, biological or radiological), process complexity relative to these hazards, and scope of services. Such projects normally would include operations or maintenance or capital project services for specialty and bulk chemical, petrochemical, biopharmaceutical, radiological processes, aerospace, and hazardous waste operations.
Exposure Modeling	The use of calculations, mass balance and other theoretical means to determine estimates of worker exposure. In some instances, exposure modeling can be used to establish the rationale for not requiring worker monitoring. It can also be used to prioritize monitoring sequences.

Health Hazard	Physical, chemical, and biological stresses that may cause sickness, impaired health, significant discomfort, or inefficiency in workers.
Health Physicist	A professional health physicist with a degree in health physics and/or a Certified Health Physicist (CHP), who is certified by the American Board of Health Physics or equivalent for non-US operations.
Immediately Dangerous to Life or Health (IDLH)	Airborne exposure to a chemical in a concentration above which is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.
Industrial Hygiene Surveillance Plan	A project level plan that is a key output of the Health Hazard Evaluation process. The plan will identify exposure groups, monitoring requirements by exposure group, monitoring sequence, timeframes and basic rationale when monitoring may be ceased. This plan can be used to estimate IH resources required to support a project and will be a key document reviewed during SERs associated with chemically complex projects.
Occupational Exposure Limit (OEL)	The OEL is the adopted exposure limit value to be used for exposure assessment. The OEL would typically be a PEL or TLV that is considered to be most protective of worker health under the conditions of exposure. Initially the OEL chosen will be the lowest number between Federal or state PELs or the TLV. If well characterized monitoring results fall between the most restrictive value and a less restrictive value, further evaluation will be warranted.
Other Health Hazard Terminology	Refer to HSEP 1.3, for hazard communication
Permissible Exposure Limit (PEL)	Regulatory limits developed by OSHA to indicate the maximum airborne concentration of a contaminant to which an employee may be exposed over the duration specified by the type of PEL assigned to that contaminant.
Project Industrial Hygienist	An individual possessing the skills, experience and education necessary to effectively identify, evaluate and recommend controls for project level health hazards. This individual should be recognized by the Senior Industrial Hygiene Manager as technically competent.
Recommended Exposure Limit (REL)	Issued by the National Institute of Occupational Safety and Health to aid in controlling hazards in the workplace. These limits are generally expressed as 8- or 10-hour TWAs for a 40-hour workweek and/or ceiling levels with time limits ranging from instantaneous to 120 minutes.
Senior Industrial Hygiene Manager	A professional industrial hygienist (CIH) certified by the American Board of Industrial Hygiene or equivalent for non-U.S. operations.
Threshold Limit Values (TLV)	A registered trademark for an exposure limit developed by the American Conference of Governmental Industrial Hygienists (ACGIH). These values are research based and peer reviewed with rationale provided in the *Documentation of the Threshold Limit Values and Biological Exposure Indices*.

4.0 PROCEDURE

4.1. Proposal Health Hazard Evaluation

A Senior HSE Manager, with support from an IH professional as needed, shall provide HHE input and estimates of IH support requirements during the contract proposal stage for a project. Also, where applicable, contract language must stipulate that historical personal exposure monitoring data and medical surveillance data shall be provided to the Company at contract award. This information should be made readily available to the Project Industrial Hygienist and used in the development of the project IH surveillance plan.

4.2. Project Health Hazard Evaluation

For all applicable projects, an HHE shall be performed before site mobilization and concurrent with preparation of the HASAP. This evaluation will be used to develop the project IH surveillance plan and identify personnel resources required for carrying out the established plan.

The HHE scope shall include the physical, chemical, radiological, and biological health hazards. Physical health hazards include elevated noise and vibration exposures, repetitive motion work operations, ionizing and non-ionizing radiation exposures heat and cold stress and biological hazards include infectious disease agents.

The scope of the HHE shall include these elements.

4.2.1. Chemical Exposure Evaluation

Available process chemical information and facility air monitoring data relevant to the project scope of work shall be assembled and reviewed. This air monitoring data, including facility workplace area air monitoring networks and personal and area air monitoring data shall be reviewed to determine the extent of additional air monitoring, if any, will be included in the IH Surveillance Plan.

When conducting an HHE for chemically complex projects, the following is needed:

- Process chemistry including reactants
- Intermediates and end-products
- Process operating temperature and pressure
- Process hazard analysis
- Personal exposure monitoring data
- Medical surveillance data.

The Hazardous Chemical Information form, found as a figure in HSEP 1.3, Chemical Hazard Communication, should be used to assist with data collection and hazard assessment for chemically complex projects and is available, as an option, to be used in a similar manner for non-chemically complex projects.

The HHE should be summarized using the outline found at Figure 1 and included as an appendix to the project HASAP.

4.2.2. Regulated Materials

Where regulated materials are present in the scope of work, an HHE must be conducted on them. For reference, see **Figure 2** for a list of Hazardous Substances Requiring Specific Exposure Monitoring Protocols.

The HHE for specific regulated materials must address the scope of requirements for that material. As a minimum, this scope shall include:

- Allowable exposure limits,
- Exposure monitoring requirements,
- Methods of compliance for potential over exposure conditions,
- Medical surveillance program,
- Hazard communication, employee training requirements,
- Recordkeeping requirements, and
- Program review frequency.

4.2.3. Radiation Exposure Monitoring Program

When ionizing radiation hazards are present, a health physicist (HP) shall prepare, in compliance with HSEP 10.1, a separate Radiological Protection Program, or equivalent, depending on country-specific requirements.

For minor radiation source issues, an HP shall provide input to the project HHE.

4.2.4. Biological Hazard Evaluation

For biological hazard evaluation, utilize:

- HSEP 11.1, Biological Hazard Control, which provides guidance on identification, evaluation, and control of biological hazards, and
- HSEP 11.2, Bloodborne Pathogen Control, which provides guidance on identification and evaluation of common bloodborne pathogen exposure hazards.

4.2.5. Noise Exposure Evaluation

Refer to HSEP 11.6, Occupational Noise, for assessing worker noise exposures and determining the need for audiometric surveillance and worker noise control.

4.2.6. Heat and Cold Stress Control

For work to be done in extreme temperatures, refer to:

- HSEP 11.4, Cold Stress Control, and
- HSEP 11.5, Heat Stress Control.

4.2.7. Repetitive Motion Work Operations

For work involving repetitive motion, refer to HSEP 11.8, Ergonomics, for evaluation and control procedures for field and office repetitive motion stress.

4.2.8. Medical Surveillance Program

An evaluation of the scope of project health hazards shall be used to provide input for the development of the project occupational medical program.

When a potential health hazard is identified, pre-placement and periodic medical surveillance shall be reviewed to verify that the engineering, administrative, or personal protective equipment controls are effective.

Medical surveillance summaries and identified restrictions shall be maintained in a common database so proper tracking, coordination and follow-up can be performed.

4.3. Industrial Hygiene Surveillance Plan

The IH Surveillance Plan will be included in the HHE. It will provide a breakdown of exposure groups identified for the defined scope of work and a summary of required and recommended worker monitoring to be performed including IH exposure assessments and medical monitoring requirements. When necessary, the plan will document the rationale for sampling / not sampling exposure groups by referencing exposure modeling utilized and historical information reviewed during development of the HHE as necessary.

The IH Surveillance Plan will be summarized using the attached format. This summary will include monitoring requirements and an estimated timeline for implementation. In some instances, regulatory requirements will apply to the monitoring schedule and will be noted as such on the summary. This summary sheet will be reviewed during subsequent SERs for adequate implementation.

The IH Surveillance Plan should address

- Which exposure groups require IH monitoring and medical surveillance
- Specific substances or agents to be monitored,

- The OELs to be used to evaluate results
- The statistical basis to continue or cease monitoring
- Specific medical testing/protocol to be implemented

See HSEP 12.2 for requirements related to specific personal and area air monitoring procedures.

Results for all IH monitoring shall be maintained in a common database in order to minimize whenever possible, duplication of sampling similar / common tasks. The database can also be utilized to maintain ready access to IH information and to provide historical preservation of information per regulatory requirements.

4.4. Implementation

After the HHE is completed, the results will be documented in the project HASAP and used in the development of task-specific SPAs and worker training.

The Industrial Hygiene Surveillance section of the HHE will be utilized by the Site HSE Supervisor to conduct and coordinate appropriate monitoring. In instances when there is a Project Industrial Hygienist assigned full time to the program, the Project IH will be responsible for implementing the IH Surveillance Plan as required.

Reports for each round of IH monitoring should be written following the basic format outlined in HSEP 12.2.

The project HHE should be used in conjunction with chemical hazard communication training in order to provide focus on health hazards, particularly for the development of task SPAs.

The HHE also provides process input to support the medical monitoring and training requirements of substance-specific regulatory standards.

If new health hazards are identified during the course of the project, the HHE and all associated programs impacted by the changes shall be updated as well. These include the HASAP, SPAs, IH Surveillance Plan, worker training and medical monitoring.

4.5. Control of High Health Hazard Tasks

If the HHE identifies work conditions such as the following, the exposure must first be mitigated or work shall not be performed.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are >50% of Immediately Dangerous to Life or Health (IDLH) concentrations, or
- Work with sensitizers or known human carcinogens, mutagens, or teratogens without process isolation or fully encapsulating personal protection, or
- Work with highly infectious biological agents without process isolation.

If work in these environments is necessary, the Project Manager shall appeal to the appropriate senior operations manager and Senior HSE Manager for written approval to proceed and for specific safe work procedures.

5.0 REFERENCES

HSEP 1.3, Chemical Hazard Communication

HSEP 12.2, Personal Air Monitoring

6.0 FIGURES

Health Hazard Evaluation Outline

Hazardous Substances Requiring Specific Exposure Monitoring Protocols

Industrial Hygiene Surveillance Plan Summary

Figure 1

Health Hazard Evaluation Outline

Section 1
Process Summary - include key areas or sections within each process.

Section 2
Staffing Information - include shift durations, length of project, number of personnel on site.

Section 3
Identification of Exposure Groups.
This can be any logical grouping, but consistency should be used throughout the groupings. For example don't group by process in one area and trade in another. It should also include supervisory personnel working in the field. An estimated count of personnel in each group should be included.

Typically for craft workers, exposure groupings can be made by trade, however if one group of personnel only work on one process it may be useful to break the groupings down further; (e.g. welders process 1; pipe fitters process 2).

Section 4
Discussion of health hazards identified and assumptions used in exposure assessment. For each exposure group, evaluation should include conclusion on the need (or lack of need) for field monitoring.

This should address the following for each exposure group:

- Which require IH monitoring and medical surveillance
- Specific substances or agents to be monitored,
- The OELs to be used to evaluate results
- The statistical basis to continue or cease monitoring
- Specific medical testing/protocol to be implemented

The plan should be summarized on the table found in attachment 3 or a similar summary format be used for easy reference and tracking.

Figure 2

Hazardous Substances Requiring Specific Exposure Monitoring Protocols

This list contains regulated materials for which there are specific worker exposure monitoring requirements. These chemicals and hazardous substances may be found in the scope company projects, but this does not necessarily represent an inclusive list, and other/additional regulatory standards may apply in some locations.

- 1, 3-butadiene
- acrylonitrile
- asbestos
- benzene
- cadmium
- calcium arsenate
- cotton dust
- ethylene oxide
- ethyleneimine
- formaldehyde
- hazardous waste operations
- hexavalent chromium
- inorganic arsenic
- lead
- methylene chloride
- methylenedianiline
- vinyl chloride

Figure 3

IH Surveillance Plan Summary

Site Name:

Exposure Group:

Task:

1. Contaminant or Agent	2. Exposure Probability	3. Health Effect Rating	4. Uncertainty Rating	5. Risk Rating	6. Month /Yr to Monitor or Monitored	7. Applicable OEL and Range of Results	8. Control Strategy Implemented
Benzene	*1*	*5*	*0*	*0*	N/A	0.5 ppm - 8 hr TWA	
Methyl Ethyl Ketone	*3*	*1*	*1*	*3*	3Q FY10	200 ppm - 8 hr TWA	
Lead	*2*	*5*	*2*	*20*	1Q FY10	0.05 mg/m^3 - 8 hr TWA	
Noise	*4*	*3*	*0*	*0*	N/A	85 dBA - 8 hr TWA	

Instructions to Complete IH Surveillance Plan Summary

Note: One or more of these pages will be completed for each exposure group identified in the HHE.

Enter the name of the site and exposure group at the top of the table. If the exposure group is tasked based, enter the name of the task.

1. List each contaminant or agent for that exposure group in column 1. Do not enter trade names, acronyms or product names. As an example do not list "carbon steel welding rods" as a contaminant.
2. List the exposure probability in column 2. Use the following scale to identify exposure probability:
   - 1 for exposures up to 10% of the OEL
   - 2 for exposures from 10% - 50% of the OEL
   - 3 for exposures from 50% to 100% of the OEL
   - 4 for exposures greater than 100% of the OEL
3. Enter the health effect rating in column 3 using the following scale:
   - 1 for agents posing reversible effects from chronic or acute exposures
   - 3 for agents posing irreversible health effects from chronic exposures
   - 5 for substances which have been identified by the ACGIH as A1 carcinogens, those substances listed in 29 FCR 1910.1001 – 1910.1052 and those substances which pose life threatening or disabling effects with acute exposure.
4. In column 4 list the uncertainty rating as follows:
   - 0 for well characterized exposures
   - 1 for uncharacterized exposures
   - 2 for highly variable, uncharacterized exposures
5. Overall risk rating is determined by multiplying columns 2 x 3 x 4. Enter the product in column 5.
6. In column 6 list the date sampling is expected to be completed. Contaminants with the highest values in column 5 should be sampled first as these are expected to pose the greatest health risk to our personnel. In some instances, regulatory requirements drive an exposure assessment to be conducted within a specified period of time.
7. In column 7 list the applicable OEL used to evaluate exposures and the range of results received for that contaminant.
8. In column 8 state whether a control strategy was implemented and if the strategy was engineering, administrative or personal protective equipment (PPE).

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HSE Procedure		Document No: HSEP 13.9	Page: 1 of 3
Respiratory Protection Program		Supersedes: HSEP 13.9	Revision: 4 Issue Date: 15 Oct 08
Issuing Department: Corporate HSE	Approval: Brandon.Russell@Jacobs.com	Previous Rev. Date: 3, 14 Jan 08	Effective Date: 15 Dec 08

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1.0 PURPOSE AND SCOPE

Jacobs employees and subcontractor employees shall be provided protection from occupational exposure where a potential hazard to dusts, fumes, mists, radionuclides, gases, vapors, biological airborne contaminants, or oxygen deficiency exists.

This Health, Safety, and Environment Procedure (HSEP) provides a strategy to be followed when respiratory hazards are encountered to protect our worker's health Details of site-specific program requirements are presented in the attachment to this procedure, HSEP 13.9f1.

Note that prior to the development of a site-specific respiratory program, a project health hazard evaluation (see HSEP 12.1) must be performed.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Program Administrator

A Program Administrator shall be appointed for each Jacobs business region by the respective regional Senior HSE Manager.

Program Administrators must have specific training and experience in all aspects of respiratory program management. They are responsible for the administration of the Regional Respiratory Protection Programs and evaluation of the effectiveness of each site program.

2.2. HSE Manager

The HSE Manager shall collaborate with the Industrial Hygiene Manager and other personnel, as appropriate, to develop the site-specific Respiratory Protection Program and revise as needed.

2.3. Industrial Hygiene Manager

The Industrial Hygiene Manager, when requested for collaboration, will provide technical support in the development and evaluation of site-specific Respiratory Protection Programs.

3.0 DEFINITIONS

Definitions related to the Respiratory Protection Program appear in HSEP 13.9f1, the model for a Site-specific Respiratory Protection Program.

4.0 PROCEDURE

4.1. Site-specific Respiratory Protection Program

A Site-specific Respiratory Protection Program shall be developed for each site at which respiratory protection is used by employees of the Company. Contractors, whose employees use respiratory protection, shall also develop and implement a Site-specific Respiratory Protection Program or agree in writing to follow the company program.

HSEP 13.9f1 shall be used as a template for preparation of a written Site-specific Respiratory Protection Program. This model program satisfies Federal OSHA's requirements for US operations. The site Health Hazard Evaluation (see HSEP 12.1) shall be used as input in the development of this program.

Client respiratory protection programs may be adopted if determined by the Program Administrator to meet the requirements of this Program. In such cases, program documentation must be created to clearly identify the client's program as the Company's site-specific written Respiratory Protection Program.

The Program Administrator shall review and approve the Site-specific Respiratory Protection Program.

4.2. Program Administration

The Program Administrator is responsible for the administration of the program and evaluation of the Program's effectiveness.

Site HSE Supervisors assist the Program Administrator with program management and with routine observations to verify program effectiveness.

4.3. Program Components

Respiratory Protection Program components include:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Fit testing procedures for tight-fitting respirators,
- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and otherwise maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators,
- Procedures for regularly evaluating the effectiveness of the program, and
- Means of documenting compliance with the program.

4.4. Periodic Program Review

The written Site-specific Respiratory Protection Program shall be reviewed and updated at least annually or when there is a change in scope of work that potentially impacts worker exposure. (See HSEP 12.1, Health Hazard Evaluation.)

4.5. Program Effectiveness Evaluation

Program effectiveness observations should be documented through the use of Form A-5, Respiratory Protection Program Checklist, found in the Site-specific Respiratory Protection Site-specific Respiratory Protection Program.

Observation frequency shall be determined by the complexity of the site's Respiratory Protection Program.

Safety Observation Reports (SORs) and Safety Evaluation Reports (SERs) can also be used to document Program effectiveness.

The Site HSE Manager shall ensure that noted deficiencies are corrected as soon as possible.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.134, Respiratory Protection

29 CFR 1926.103, Respiratory Protection

ANSI Z-88 1992, Respiratory Protection

HSEP 12.1, Health Hazard Evaluation

HSEP 13.9f1, Site-specific Respiratory Protection Program

HSET 13.9, Jacobs Respiratory Protection Training Program

NIOSH 42 CFR 84 and 30 CFR 11, Certified Respiratory Equipment

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HSE Procedure		Document No: HSEP 15.3	Page: 1 of 5
Work Over or Adjacent to Water		Supersedes: Rev. 2	Revision: 3 Issue Date: 22 Oct 03
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 21 Aug 01	Effective Date:: 22 Dec 03

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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when working over water or adjacent to water. This includes, but is not limited to, rivers, lakes, canals, settlement ponds, and open tanks containing liquids.

Work activities conducted while on ships, barges, and other watercraft will require additional safety procedures and appropriate training. Refer to HSEP 15.4, Offshore Work Locations.

This HSEP applies to all employees and subcontractors engaged in operations covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Personal Flotation Devices	Also referred to as flotation aids, life vests, or life jackets. Such devices are designed to be worn by personnel working over or near water. Personal Flotation Devices (PFDs) include both inflatable devices and those constructed of inherently buoyant materials. Each type of PFD is classified by its intended use and design features.
Throwable Device	Made of an inherently buoyant material (does not include inflatable devices) that is primarily intended for use in calm, inland water, where additional means of rescue is present. Designed to be thrown to a person in the water and grasped and held by the user until rescued. Throwable devices are not designed to be worn. Such devices include buoyant cushions, life ring buoys, and horseshoe buoys.

Type I PFD	Classified by the USCG (or equivalent agency) as an off-shore life jacket, this type PFD provides the most buoyancy of all types. It is effective for all waters, especially open, rough, or remote waters where rescue may be delayed. It is designed to turn most unconscious wearers in the water to a face-up position. If this type PFD is required for work, it shall also be equipped with a water-activated light and reflective tape.
Type II PFD	Classified by the USCG (or equivalent agency) as a near-shore buoyancy vest, this type PFD is intended for calm, inland water or where there is a good chance of quick rescue. Inherently buoyant PFDs of this type will turn some unconscious wearers to a face-up position in the water, but the turning is not as predictable as a Type I.
Type III PFD	Classified by the USCG (or equivalent agency) as a flotation aid, this type PFD is good for conscious users in calm, inland water, or where there is a good chance of quick rescue. It is designed so wearers can place themselves in a face-up position in the water. Float coats, fishing vests, and vests designed with features suitable for various sports activities are examples of this type of PFD.
Type V PFD	Classified as a *special use device*, this type PFD may be used only if approved by the USCG or equivalent agency for “Commercial Use” or “Use as A Work Vest”. It is intended for specific activities and may be used only in accordance with the approval conditions on its label. A Type V PFD provides performance of either a Type I, II, or III PFD, as marked on its label. An inflatable PFD is considered a Type V PFD and is designed for continuous wear. Inflatable PFDs are equipped with manual or automatic (water-activated) inflation systems. They provide good flotation with performance characteristics identified on their labels. Inflatables with Type I or II performance characteristics have 11 pounds more buoyancy than a Type I with inherent buoyancy. Inflatables must have regular inspections and proper re-arming and maintenance to ensure proper performance. Under no circumstances should this PFD be used as a safety harness for climbing activity. Some Type V devices provide significant hypothermia protection. Examples include deck suits, work vests, board sailing vests, and life vest with safety harness.
USCG	The United States Coast Guard

4.0 PROCEDURE

4.1. General

Any person working over or near water, on floating vessels, docks, or where the danger of drowning exists must wear a company-approved Personal Flotation Device (PFD) as described in the Personal Protective Equipment section below.

Before and after each use, the PFD shall be inspected for defects that would alter its strength, buoyancy, or fastening capabilities. Defective PFDs shall not be used.

Company-approved throwable devices, such as 30-inch life ring buoys, with at least 90 feet of line attached, shall be provided and readily available for emergency rescue operations whenever workers are over or near water. Distance between throwable devices shall not exceed 200 feet or 61 meters.

A suitable lifesaving skiff with an adequate outboard motor shall be available at locations where employees are working over or adjacent to water and shall also be readily available for emergency use. The skiff and site rescue team should be capable of retrieving within four minutes a person who has entered the water. This skiff shall be equipped with two oars or paddles, a throwable device with line attached, and any needed equipment for night operation,

including searchlights. The rescue skiff and rescue equipment shall be inspected periodically. It will be taken on a maintenance run or rescue drill at least monthly.

Employees must work in pairs and exercise extraordinary care in performing their work. The "Buddy System" will be followed and at least two persons will be in sight of each other at all times.

Cables on cranes and hoists, rigging, boat attachments, and other equipment located over or near water should be inspected frequently and regularly lubricated since environmental conditions at these locations may cause increased corrosion.

4.2. Personal Protective Equipment

Every effort shall be made to provide for 100% fall protection for any person working near or over water, whenever outside of a complete guardrail system.

Any person working near or over water where 100% fall protection is provided shall also wear a Type I, II, III, or V PFD, or equivalent. A Type III or V PFD, or equivalent, may be used only if approved for "Commercial Use" or for "Use as A Work Vest."

When 100% fall protection cannot be achieved, any person working near or over water, or on floating vessels, shall wear a PFD rated Type I or equivalent or a Type V water-activated inflatable PFD with a performance rating equivalent to a Type I or Type II device (a minimum of 33 pounds of buoyancy) that maintains the face-up position of the wearer. These types of PFDs shall also be equipped with a water activated light, whistle, and reflective tape.

When open flame activities (e.g., welding, burning, gouging) are required, inflatable vests shall not be worn.

Do not tie-off to a man basket or an aerial lift that is being used over or adjacent to water if tying off to this equipment would increase the hazard of drowning. In these cases, a Type V PFD that provides a quick release-under-load feature must be used.

Do not attach a PFD and safety harness to boat or equipment that is at risk of sinking or capsizing unless the lanyard is less than 6.5 feet in length and equipped with quick-release-under-load hardware.

4.3. Dock Work

The following requirements apply to all personnel assigned work on a dock or similar structure that is located over or adjacent to water.

- There must be a means of communication by two-way radio and/or telephone between the dock area and main facility personnel.
- A pre-determined distress signal shall be agreed upon in case of emergency.
- A log will be maintained at the dock site. Everyone is expected to sign in when arriving and sign out on departure.
- Unauthorized personnel are not allowed in the dock area. Employees must check in with their supervisor before going on the dock.
- Corporate HSE must be notified before any unusual work activities are conducted on the dock or a vessel.

4.3.1. Burning and Welding Operations

Experience indicates that burning and welding are among the most critical hazards of dock activities. However, these activities can be performed safely if proper precautions are taken before such work begins and while it is in progress. The following procedures apply to burning and welding operations on docks.

- Hot work permits must be obtained prior to starting work.
- No welding operation may begin before the supervisor in charge issues specific instructions.

- Fire protection equipment must be available, charged and ready for immediate use when cutting or welding operations are in progress.
- A means of signaling shall be prearranged whereby burning or welding operations cease should a hazardous situation arise.
- Working alone is not allowed on any dock.
- A “firewatch” shall be stationed at all welding or burning locations.
- When open flame activities (e.g., welding, burning, gouging) are required, inflatable vests shall not be worn.

4.3.2. Procedures for Abandonment

Abandonment from a dock by jumping into the water can be particularly hazardous and should be done only if there is no other means of escape. The following rules should be followed in the event the dock must be abandoned.

- Make sure PFD is on securely.
- Go to the lowest point possible and enter the water on the downstream shoreline side. This will prevent you from being swept into the dock pilings.
- Remove hard hat.
- Look to see that the way is clear and free of protruding objects.
- Place one hand over mouth and nose.
- Grasp the PFD over the opposite shoulder with the other hand.
- Keep elbows downward tightly against the chest.
- Take a deep breath, jump feet first keeping the body erect with legs crossed and feet locked together, and keep eyes on the horizon.

Recommended behavior for victims in cold water

- Try to keep head clear of the water.
- Unless land or a structure is in easy reach, holding still on the water is preferable to swimming or other vigorous movement.
- Curl body by tucking in knees and keeping arms close to body for maximum heat conservation.
- If there are two or three persons in the water, huddle while waiting for rescue.
- Get out of the water and onto a log or other floating debris if possible.
- Above all, stay calm and keep alert!

4.4. Requirements for Vessel and Barge Loader/Offloader Qualification

All employees assigned to dock operations shall be instructed in the applicable requirements of this HSEP, as well as the facility-specific safety requirements and standard operating procedures. All employees involved in the loading or offloading of bulk materials in the US are governed by 29 CFR 1917, Marine Terminals.

All personnel loading or offloading vessels or barges shall successfully complete a company-approved written test applicable to the work assigned that includes safety rules and procedures specific to the work and location.

Prospective operators must also successfully complete a visual or practical skills (dock-work) exercise of the material handling equipment to be used and this exercise will be supervised by a designated competent person.

All barge loader/operators shall annually complete a refresher or review of the information and requirements presented in the initial program.

For regularly operated facilities, annual visual or practical skills assessment is not required, provided the employee’s supervisor documents safe operation of the equipment during the past year. However, refresher training is required if workers have not participated in dock operations in the previous three months.

The designated competent person shall issue qualification cards to workers who successfully complete these requirements.

4.5. Mobile and Heavy Equipment Operations

Only skilled, trained, and authorized personnel will be allowed to operate mobile and heavy equipment.

The structural integrity of any dock or other surface onto which mobile and heavy equipment will be used shall be evaluated by a qualified person and determined to be safe.

Due to excessive humidity and corrosive environments typically associated with work over or adjacent to water, routine equipment inspections should be conducted with greater frequency.

Mobile and heavy equipment operators, working over or adjacent to water, must wear PFDs at all times, including while operating equipment.

Refer to appropriate HSEPs found in Section 17, Heavy Equipment, of the HSEP Manual.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1926.106, Working Over or Near Water

29 CFR 1926.605, Marine Operations and Equipment

29 CFR 1917.95, Personal Protection

29 CFR 1917.26, First-Aid and Lifesaving Facilities

46 CFR Part 160, USCG-approved PFDs

Section 17, Heavy Equipment, HSEPs found in the Jacobs HSEP Manual.

APPENDIX B
HEALTH HAZARD EVALUATION

HEALTH HAZARD EVALUATION

Process or Task	Chemical	Hazard	Hazard Level	Exposure Route	Identify Initial PPE	Comments, Unusual Issues
Equipment Staging and Dredge Support	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposure may occur from vehicle dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Pipeline Management	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Should not directly involve fly ash or proximity to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Debris Removal	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Wet process, dust not expected under normal conditions.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Dredging	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Wet process, dust not expected under normal conditions.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Rim Ditch Management	Crystalline Silica	Suspect Carcinogen	Mod.	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Wet process, however area is in proximity to windrow locations and could be downwind.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Staging and Stockpiling Activities (“Ball Field”)	Crystalline Silica	Carcinogen	High	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots respiratory protection likely needed	Likely one of the highest potential areas for exposures to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Mod	Inhalation		

Process or Task	Chemical	Hazard	Hazard Level	Exposure Route	Identify Initial PPE	Comments, Unusual Issues
Railcar Prep and Load-out	Crystalline Silica	Suspect Carcinogen	High	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots respiratory protection likely needed	Likely one of the highest potential areas for exposures to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Mod	Inhalation		
Railcar Control	Crystalline Silica	Suspect Carcinogen	Mod.	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Area is in proximity to windrow activities.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Equipment Maintenance and Repair	Crystalline Silica	Suspect Carcinogen	Mod.	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposure to dust on equipment.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Process Management and Oversight	Crystalline Silica	Suspect Carcinogen	Mod	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposures possible.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		

Notes:

Hazard: Flammable (F), Combustible (C), Explosive (E), Reactive (R), Oxidizer (O), Corrosive (Corro), Radioactive (Radio), Primary or Secondary Irritant (I), Simple or Chemical Asphyxiants (Asphy), Anesthetic (Anes), Narcotic (Narco), Hepatotoxic or Nephrotoxic or Neurotoxin Systemic Poison (P), Sensitizer (Sens), Carcinogen (Carc), Mutagen (Muta), Teratogen (Terato)

Hazard Level: Low: ≤10% PEL, TLV, STEL, ceiling, peak, LEL
Moderate (Mod): >10% and < 100% PEL, TLV, STEL, ceiling, peak, LEL
High: ≥100% PEL, TLV, STEL, ceiling, peak, LEL. Note: Preplanning, management approval, and monitoring required for all IDLH tasks.

Exposure Route: Inhalation (Inh), Ingestion (Ing), Skin Absorption (Abs), Skin or Eye Contact (Con).

Personal Protective Equipment (PPE): Identify the specific PPE to be donned based on chemicals and chemical concentrations expected.

IDHL = immediately dangerous to life and health
LEL = lower explosive limit
PEL = permissible exposure limit
STEL = short term exposure limit
TLV = threshold limit value

APPENDIX C
SITE-SPECIFIC RESPIRATORY PROTECTION PLAN

APPENDIX C

SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

SITE WIDE SAFETY AND HEALTH PLAN

For the

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

This Site-specific Respiratory Protection Program has been developed to define site-specific procedures for respirator use at this site.

This program establishes acceptable HSE standards and procedures to be used when respiratory protection is required.

This United States Respiratory Protection Program has been developed in accordance with the provisions of 29 CFR 1910.134 and 29 CFR 1926.103.

Program Administrator: Sean Healey, CIH, CSP

Site HSE Supervisor: Danny Whitaker-Sheppard

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FORMS

ATTACHMENTS

ATTACHMENT TABLES

1.0 PROGRAM ADMINISTRATION

The Program Administrator is responsible for the overall administration of this program and for required evaluations of the program's effectiveness.

The Program Administrator has designated the Site HSE Supervisor to assist with administration of the program and evaluation of the program's effectiveness.

Program components include:

- Program administration
- Medical evaluations of employees required to use respirators
- Procedures for selecting respirators for use in the workplace
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Procedures for regularly evaluating the effectiveness of the program

Regular program effectiveness observations should be documented through the use of the Respiratory Protection Program Checklist (Attachment C-3). Safety Observation Reports (SOR) and Safety Evaluation Reports (SER) can also be used to document program effectiveness.

The Site Supervisor, in conjunction with the Site HSE Supervisor, shall ensure that noted deficiencies are corrected as soon as possible.

2.0 MEDICAL EVALUATION

A medical evaluation will be completed to determine the worker's ability to use a respirator, before the respirator wearer is fit tested or required to use the respirator in the workplace.

Based on the findings of the medical evaluation, a medical examination may also be required.

2.1. MEDICAL EVALUATION PROCEDURES

A Physician or Other Licensed Health Care Professional (PLHCP) performs all respirator user medical evaluations. Each respirator wearer shall complete the Medical Questionnaire for Respirator Users (Attachment C-1), which is forwarded to their company physician for a written determination of the worker's ability to use the selected respirator, under the defined working conditions.

All respirator users will complete the Medical Questionnaire for Respirator Users (Attachment C-1).

If a pre-employment or annual physical is required and conducted, it may be used to meet the requirements of this section. If it includes the same information as the Medical Questionnaire for Respirator Users (Attachment C-1).

The medical questionnaire and examinations are administered confidentially during the respirator wearer's normal work hours or at a time and place convenient to the worker. The medical questionnaire is also administered in a manner that ensures the respirator wearer understands its content.

The respirator wearer is also provided an opportunity to discuss the questionnaire and examination results with the PLHCP.

Any worker who refuses to be medically evaluated for respirator use will not be allowed to use a respirator.

2.2. MEDICAL EXAMINATIONS

A medical examination is provided for any worker who gives a positive response to any of questions 1 through 8 in Section 2 of the Medical Questionnaire for Respirator Users (Attachment C-1) or whose initial medical examination demonstrates the need for a follow-up medical examination.

The medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make final determination on the respirator wearer's ability to use a respirator.

2.3. SUPPLEMENTAL INFORMATION FOR THE PLHCP

Supplemental information concerning the specific type(s) of respirator to be used and the anticipated working conditions is provided to the PLHCP, with each Medical Questionnaire for Respirator Users (Attachment C-1) before the PLHCP makes a recommendation concerning a worker's ability to use a respirator.

2.4. MEDICAL RECOMMENDATION

Following the evaluation and/or examination, a written recommendation regarding the worker's ability to use the respirator must be provided by the PLHCP. The recommendation shall provide the following information:

- Any limitations on respirator use related to the medical condition of the worker or to the workplace conditions in which the respirator will be used, including whether or not the worker is medically able to use the respirator;
- The need, if any, for follow-up medical evaluations; and
- A statement that the PLHCP has provided the worker with a copy of the PLHCP's written recommendation.

For negative pressure respirator work, if the PLHCP finds a medical condition that may place the worker's health at increased risk, a Powered Air-Purifying Respirator (PAPR) can be provided if the PLHCP determines that the worker can use the PAPR.

If a worker is wearing a PAPR because of medical restrictions and if a subsequent medical evaluation finds that the worker is medically able to use a negative pressure respirator, then there is no longer a requirement to provide a PAPR.

3.0 ADDITIONAL MEDICAL EVALUATIONS AND/OR EXAMINATIONS

An additional medical evaluation and/or examination shall be conducted if:

- A worker reports medical signs or symptoms that are related to ability to use a respirator;
- A PLHCP, supervisor, Site HSE Supervisor, or the Respirator Program Administrator determines that a worker needs to be reevaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for worker reevaluation; or
- A change occurs in workplace conditions, e.g., physical work effort, protective clothing, temperature, that may result in a substantial increase in the physiological burden placed on a worker.

4.0 RESPIRATOR SELECTION

This section presents the types of respirators available onsite and the criteria and procedure to be used to determine respiratory protection needed for specific tasks.

4.1. CRITERIA FOR RESPIRATOR SELECTION

The respirator type that is selected for each work scenario shall be appropriate for the chemical state and physical form of the contaminant. The respirator type is to be chosen using the selection logic presented in Attachment C-4. The parameters used making the selection are to be documented on Form 4-1, Respirator Selection Worksheet, or equivalent.

For each type of task for which respiratory protection is required, the selection sequence in Attachment C-4 shall be addressed. Task examples include permit-required confined space entry, first line breaks, process valve maintenance activities, painting, cleaning, or degreasing with solvents, etc.

For routine tasks, where conditions or hazards do not change, a single respiratory hazard selection evaluation is generally sufficient. If hazards, work sequences, or conditions change, the respirator selection criteria must be re-evaluated.

4.2. PARTICULATE EXPOSURE RESPIRATOR SELECTION

For particulate exposures, the particulate cartridge Types N, R, and P refer to standard performance designations established by the National Institute for Occupational Safety and Health (NIOSH).

- "N" refers to no oil exposure and 95%, 99%, or 100% (99.97%) filter efficiency.
- "R" refers to some oil up to eight hours and 95%, 99%, or 100% (99.97%) filter efficiency.
- "P" cartridge types can be used with oil exposure with no time restriction and 95%, 99%, or 100% (99.97%) filter efficiency. Individual manufactures may have different designations. To aid in decision-making on the appropriate type of respirator, individual manufacturer literature will also be used.

4.3. ASSIGNED PROTECTION FACTORS

Assigned Protection Factors (APF) as specified by the Occupational Safety and Health Administration (OSHA) and NIOSH are presented in Tables 1 through 3 in Attachment C-4.

The lower of the two factors for each respirator and contaminant type shall be used in conjunction with exposure limits and workplace concentrations to assess the appropriateness of the respirator.

Fit factors determined for an individual by quantitative fit testing or other methods are not to be substituted for the APF provided in the tables. The fit factor determined through fit testing must be greater than the APF; otherwise the respirator is not to be used.

4.4. FILTERING FACEPIECE RESPIRATOR

Filtering facepiece respirators (dust mask) are a class of air-purifying half-mask respirator. The APF of the filtering facepiece respirators are equal to that for the air-purifying half-mask

respirator. Filtering facepiece respirators are not to be used for contaminants with substance-specific standards (as listed in 29 CFR 1910.1001-1450, Subpart Z) or to protect against class A-1 carcinogens (as listed in American Conference of Governmental Hygienists Threshold Limit Value [TLV] and Biological Exposure Indices [BEI], 2006). This respirator provides protection against low levels of certain dusts and/or fumes, but does not supply oxygen, and shall not be used in an oxygen deficient atmosphere. It is not to be used in any atmosphere that is immediately dangerous to life or health.

All requirements that apply to Air-Purifying Respirators (APR) apply to filtering facepiece respirators when used for protection against contaminants with workplace concentrations greater than the respective action levels.

4.5. CARTRIDGE CHANGE SCHEDULE

At this time it is not expected that cartridges will be used on this site. The most likely item will be the P-100 filter. These filters can be used until the breathing resistance increases.

If task are identified which requires cartridges, change-out schedules will be established accordingly.

Form 4-1 - Respirator Selection Worksheet–Activities of Highest Exposure Potential

Task Description	Potential IDLH (Y/N)	Major Contaminant (separation line for each)	Exposure Limit (e.g., FEL Limits & Units)	Estimated Concentration & Units	Type of Respirator	Maximum Use Concentration	Cartridge Change Schedule
Staging and Stockpiling Activities (“Ball Field”)	N	Crystalline Silica	0.050 mg/m^3	< PEL	Air purifying, full facepiece	2.5 mg/m^3	As required based on breathing resistance
Railcar Prep and Loading	N	Crystalline Silica	0.050 mg/m^3	< PEL	Air purifying, full facepiece	2.5 mg/m^3	As required based on breathing resistance

5.0 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH ATMOSPHERES

5.1. WORKER EXPOSURE

Worker exposure to any of the following Immediately Dangerous to Life or Health (IDLH) task conditions shall be avoided.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are potentially IDLH, or
- Unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- Unprotected exposure to known chemical sensitizers.

When work in these environments seems to be absolutely necessary, the Project Manager shall appeal to the appropriate Senior Operations Manager and Program HSE Manager for written approval to proceed and specific safe work procedures.

For tasks for which there is the *potential* for IDLH atmospheres, the respirator must be a full facepiece supplied-air respirator in positive pressure mode and 5 minute (minimum) escape cylinder.

Examples of jobs that have the *potential* to become IDLH:

- Breaking into flare lines,
- Initial opening of all H2S or CO equipment vessels and lines,
- Confined space entry work where inert gas (e.g., nitrogen purge), may be present, or
- Working in certain process or sanitary sewers.

In *potential* IDLH atmospheres, ongoing air monitoring shall be conducted to verify contaminant concentrations and to detect changes.

For work in atmosphere with the *potential* for IDLH conditions, trained rescue standby person(s) located outside the *potential* IDLH area are posted and equipped with an Self-Contained Breathing Apparatus (SCBA) or supplied-air respirator on separate supply. This includes work in confined spaces that require supplied-air respiratory protection.

Standby persons will be equipped with:

- Continuous-flow or pressure-demand SCBAs or a continuous flow or pressure-demand, supplied-air respirator with a 5minute (minimum) escape air cylinder and
- Appropriate retrieval equipment (harnesses, wristlets, anklets) for removing an employee, who enters the hazardous atmosphere.

Retrieval equipment must be used unless it would increase the overall risk of rescue. Situations may exist in which retrieval lines would pose an entanglement problem, especially if airlines and/or electrical cords are present.

Verify that visual or signal line communication is maintained between personnel in the *potential* IDLH atmosphere and personnel located outside the *potential* IDLH atmosphere.

6.0 FIT TESTING REQUIREMENTS

Respirator fit testing is performed in accordance with the fit test protocols and procedures described below.

6.1. GENERAL FIT TEST PROTOCOLS

The Program Administrator will designate qualified persons to conduct qualitative and/or quantitative fit tests.

The following fit testing requirements will be met:

- Each respirator wearer will be fit-tested on each, specific (model, size) respirator worn prior to initial use and annually thereafter.
- Spectacles (glasses), goggles, face-shields, or welding helmets will be worn in a manner that does not interfere with the facepiece seal of the respirator.
- Contact lenses (soft and gas permeable only) may be worn with a full-facepiece respirator. However, some clients have policies, which prohibit their use on their sites.
- Respirator wearers shall be clean-shaven. Facial hair shall not interfere with the sealing surface of the facepiece and the face or interfere with valve function.
- User seal checks are performed each time the respirator is donned.
- Fit tests shall be documented and retained until the next fit test is administered.
- Fit test Form 6-1, Qualitative Respirator Fit-Test Record, and Form 6-2, Quantitative Respirator Fit-Test Record, may be used to document the fit test.

The respirator wearer shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

Prior to the selection process, the respirator wearer shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror will be available to assist the respirator wearer in evaluating the fit and positioning of the respirator. This instruction does not constitute the respirator wearer's formal training on respirator use, because it is only a review.

Respirator wearers shall be informed that they are being asked to select the respirator that provides the most acceptable fit.

The respirator wearer shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit. The more acceptable face-pieces are noted in case the one selected proves unacceptable.

The most comfortable facepiece is donned and worn at least 5 minutes to assess comfort. If the respirator wearer is not familiar with using a particular respirator, then he/she shall be directed to don the facepiece several times and to adjust the straps each time to become adept at setting proper tension on the straps.

Assessment of comfort shall include a review of the following points with the respirator wearer:

- Position of the respirator on the nose

- Room for eye protection
- Room to talk
- Position of respirator on face and cheeks

The following criteria shall be used to help determine the respirator fit:

- Chin properly placed
- Adequate strap tension, not overly tightened
- Fit across nose bridge
- Respirator of proper size to span distance from nose to chin
- Tendency of respirator to slip
- Self-observation in mirror to evaluate fit and respirator position

The respirator wearer shall conduct negative and positive pressure user seal checks each time the respirator is donned. Before conducting the negative and positive pressure user seal checks, the respirator wearer shall be told to seat the respirator on the face by moving the head from side-to-side and up and down slowly, while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the respirator wearer fails the user seal check. The test shall not be conducted if there is any hair growth between the skin and the facepiece-sealing surface, such as stubble beard growth, beard, mustache, or sideburns, which cross the respirator-sealing surface. Any type of apparel or obstruction, which interferes with a satisfactory fit, shall be altered or removed.

If the respirator wearer exhibits difficulty in breathing during the tests, they shall be referred to a physician or other PLHCP for a medical re-evaluation to determine whether they can wear a respirator while performing their duties.

If the respirator wearer finds the fit of the respirator unacceptable, the respirator wearer shall be given the opportunity to select a different respirator and to be retested.

A tight-fitting PAPR can be fit tested by not turning the fan motor on.

Exercise Regimen: Prior to the commencement of the fit test, the respirator wearer shall be given a description of the fit test and the respirator wearer's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the respirator wearer will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test. The fit test shall be performed while the respirator wearer is wearing any applicable safety equipment that may be worn during actual respirator use, which could interfere with respirator fit.

Test Exercises: The following test exercises are performed for all fit testing methods prescribed in this procedure, except for the Control Negative Pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol. The respirator wearer shall perform exercises, in the test environment, in the following manner.

6.1.1. Normal Breathing

In a normal standing position, without talking, the respirator wearer shall breathe normally.

6.1.2. Deep Breathing

In a normal standing position, the respirator wearer shall breathe slowly and deeply, taking caution so as not to hyperventilate.

6.1.3. Turning Head Side to Side

Standing in place, respirator wearer shall slowly turn his or her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the respirator wearer can inhale at each side.

6.1.4. Moving Head Up and Down

Standing in place, the respirator wearer shall slowly move his or her head up and down. The respirator wearer shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

6.1.5. Talking

The respirator wearer shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The respirator wearer can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

6.1.6. Rainbow Passage

"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

6.1.7. Grimace

The respirator wearer shall grimace by smiling or frowning. (This applies only to Quantitative fit test (QNFT) requirements testing; it is not performed for Qualitative Fit Test [QLFT].)

6.1.8. Bending Over

The respirator wearers shall bend at the waist as if they were to touch their toes. Jogging in place shall be substituted for this exercise in those test environments, such as shroud type QLFT units, which do not permit bending over at the waist.

6.1.9. Normal Breathing

In a normal standing position, without talking, the respirator wearer shall breathe normally.

Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.

The respirator wearer shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

6.2. QUALITATIVE FIT TEST REQUIREMENTS

Negative-pressure air purifying respirators that will be worn in concentrations that are equal to or less than 10 times the Permissible Exposure Limit (PEL) may be fit tested using QLFT. (QLFT may only be used to fit negative pressure air purifying respirators that allow for a fit factor of 100 or less.) QLFT is not to be used to test for respirator fit if the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens.

The person administering the QLFT will be able to prepare test solutions, calibrate equipment, and perform tests properly; recognize invalid tests; and ensure that test equipment is in proper working order.

The QLFT equipment is to be kept clean and well maintained so as to operate within the parameters for which it was designed.

6.3. QUANTITATIVE FIT TEST REQUIREMENTS

The following QNFT methods are acceptable:

- Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator. The QNFT is to be used for fit factors greater than or equal to 100 for tight fitting half-facepiece or greater or equal to 500 for tight fitting full facepiece respirators.
- If the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens, it is required that the QNFT be used to test for respirator fit.
- QNFT using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit.
- QNFT using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

QNFT Procedure:

- The person administering the QNFT will be able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- The QNFT equipment must be kept clean, maintained, and calibrated according to the manufacturer’s instructions so as to operate at the parameters for which it was designed.
- Once a respirator has been modified or altered with a fit test probe, the facepiece will only be used for fit testing. When the facepiece is returned to the original NIOSH tested-and-certified configuration, the facepiece may be returned to service.

Form 6-1 - Qualitative Respirator Fit-Test Record

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations

The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by Jacobs *HSEP 13.9, Respiratory Protection Program*.

Check all that apply:

☐ None ☐ Beard/Facial Hair ☐ Dentures
☐ Prescription Eyeglasses ☐ Contact Lenses

Scars/Other: Explain: _____

Fit-Test Record

Respirator (Make, Model, and Size): _____

Qualitative Fit-Testing Agent:

☐ Bitrex™ (Denatonium Benzoate)
☐ Isoamyl Acetate (Banana Oil)
☐ Irritant Smoke (Stannic Chloride)
☐ Saccharin Solution

Fit-Test Results

☐ **PASS:** Fit-Test Agent Not Detected Inside the Facepiece by Respirator Wearer (Worker's signature is required.)

I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

☐ **FAIL:** Fit-Test Agent Detected Inside the Facepiece by Fit-Tested Worker.

Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit Test: _____

Respirator Wearer's Signature: _____

Form 6-2 - Quantitative Respirator Fit-Test Record

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations

The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by Jacobs *HSEP 13.9, Respiratory Protection Program*.

Check all that apply:

☐ None ☐ Beard/Facial Hair ☐ Dentures
☐ Prescription Eyeglasses ☐ Contact Lenses

Scars/Other: Explain: _____

Fit-Test Record

Respirator (Make, Model and Size): _____

Quantitative Fit Testing

Ambient Aerosol Condensation Nuclei Counter (Portacount): ☐ Yes ☐ No
Controlled Negative Pressure: ☐ Yes ☐ No

Fit-Test Results

☐ **PASS:** I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

☐ **FAIL:** Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: _____

Respirator Wearer's Signature: _____

7.0 PROPER RESPIRATOR USE

7.1. GENERAL REQUIREMENTS

All respirators, filters, cartridges, and components used at this site shall be certified by NIOSH and shall be worn in accordance with all manufacturers' instructions.

Respirators shall be used only for the purpose intended and shall not be modified in any way.

Tight-fitting facepiece respirators are not to be worn by workers, who have any condition that interferes with the face-to-facepiece seal or valve function (such as facial hair).

If a worker wears corrective glasses or goggles or other personal protective equipment, the Site HSE Supervisor shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

For all tight-fitting respirators, a user seal check is conducted each time the respirator is donned. Tight-fitting respirators that cannot be seal-checked are not acceptable for use.

Site management shall ensure appropriate surveillance of work area conditions and degree of worker exposure or stress. When there is a change in work area conditions or degree of worker exposure or stress that may affect respirator effectiveness, the Site HSE Supervisor shall reevaluate the continued effectiveness of the respirator. The worker's Supervisor will ensure that workers can leave the area:

- To wash their faces and respirator face-pieces as necessary to prevent eye or skin irritation associated with respirator use;
- If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece; or
- To replace the respirator or the filter, cartridge, or canister elements, when vapor or gas breakthrough is detected, changes in breathing resistance occurs, or when there is leakage of the facepiece. The respirator will be replaced or repaired before allowing the worker to return to the work area.

Prior to use, the following items are visually inspected, as appropriate:

- Tightness of connections
- Condition of facepiece
- Head straps
- Valves and connecting tube
- Cartridge/canisters
- Elastic parts (for pliability)
- Respirator function

7.2. PROCEDURES FOR USING THE RESPIRATOR

Inspect the respirator before use to verify that all parts are present and in good working order.

Follow the manufacturer's instructions when donning and adjusting the respirator straps. Some disposable single-use respirators utilize elastic straps and adjustable buckles.

If detection of vapor inside the facepiece (by smell or otherwise) or difficult breathing is experienced, workers are trained to leave the area immediately, report the condition to their supervisor, and provide the respirator to the Site HSE Supervisor for inspection.

7.3. PARTICULATE FILTER RESPIRATOR

Particulate Filter Respirators provide protection against low levels of certain dusts and/or fumes (Attachment C-4, Table 1). This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health.

7.4. CHEMICAL CARTRIDGE RESPIRATOR/AIR PURIFYING RESPIRATOR (NON-IDLH)

Limitations – This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health. Workers are trained to leave the area immediately if an odor is detected inside the respirator.

These respirators provide protection against low levels of certain gases and vapors. Respirator canisters or cartridges shall be specifically selected for concentrations of gases and/or vapors that may be encountered (Attachment C-4, Table 2).

APR shall not be used for rescue or emergency work.

Cartridges are replaced in accordance with cartridge change schedule stated in the Respirator Selection Worksheet, Form 4-1, or if workers can smell or otherwise detect vapors inside the facepiece, or if difficulty breathing is experienced, the cartridges will be changed.

7.5. AIRLINE RESPIRATOR

Limitations – An airline respirator shall not be used in any atmosphere that is immediately dangerous to life or health, including an oxygen deficient atmosphere, unless equipped with a self-contained escape (5, 15, or 30 minute) air cylinder.

Procedures for using airline respirators:

- Workers shall inspect all equipment before each use to assure all parts are present and in good working order.
- If using an escape air cylinder, user will ensure that air supply is of sufficient capacity (5, 15, or 30 minute) to permit safe escape from work area.
- The worker will then follow the manufacturer's instruction to select correct length of airline hose.
- Connect hose to regulator and air supply. (The maximum air pressure at the point of attachment of hose to air supply is determined by manufacturer's instructions.)
- The worker will then don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- Next the worker shall connect the respirator to the regulator and adjust the airflow in the facepiece.
- In case of respirator malfunction, workers are trained to leave the area immediately, report the condition to their supervisor.

Procedures for using airline respirators with compressors:

- If using a compressor, the worker and their supervisor, or the Site HSE Supervisor, will verify that the compressor's air intake is in an uncontaminated area. Air-purifying filters and/or sorbents shall be used if necessary to assure Grade D quality air. (Refer to Section 7.7, Breathing Air Quality.)
- Record on a tag, which will be maintained at the compressor, the most recent filter change date and the signature of the person authorized to perform the filter change.
- If the compressor is oil-lubricated, it shall be equipped with high temperature and carbon monoxide alarms that are both audible and visual.
- For compressors that are not oil-lubricated, ensure that carbon monoxide levels in the breathing air do not exceed 10 parts per million (ppm).
- In-line air purifying sorbent filters with water and oil traps shall be installed between the compressor and user(s).

7.6. SELF-CONTAINED BREATHING APPARATUS

SCBAs are provided primarily for use in emergency response when spills, leaks, or other circumstances present respiratory hazards.

Grade D breathing air quality cylinders shall be stored and maintained in a fully charged state and shall be recharged if the pressure falls to 90% of the manufacturer's recommended pressure level.

Limitations – Air supply is generally rated for 30 minutes. Heavy exertion and excitement will increase the breathing rate and deplete the air supply sooner. Workers are trained to leave the area when the alarm indicates low air supply.

Procedures for using the equipment:

- Workers shall inspect the unit before each use and ensure a sufficient air supply (at or above 90%) and that the regulator and low pressure warning devices function properly.
- The user will then open the cylinder air supply valve.
- Next, don unit so cylinder is on the user's back with the valve pointing down and engage and tighten the harness.
- Then the worker will don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- The worker will then connect the facepiece hose to the regulator.
- Workers are trained to use the bypass only in the event of regulator failure and to leave area immediately, whenever the low-pressure alarm sounds.

Care and maintenance of SCBAs is performed by a qualified person.

Bottles are refilled only with breathing air that meets the specifications for Grade D Breathing Air in Compressed Gas Association Commodity Specification G-7.1-1989. Grade D has an oxygen content of 19.5 to 23.5%, condensed hydrocarbon of 5 milligram per cubic meter (mg/m^3) or less, carbon monoxide of 10 ppm or less, carbon dioxide of 1,000 ppm or less, and lack of noticeable odor.

SCBA emergency use respirators are kept accessible to the work area and stored in compartments or in covers that are clearly marked as containing emergency respirators.

All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.

Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

For respirators maintained for emergency use, the Site HSE Supervisor or Supervisor will assure the presence of a tag or label containing the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator. This information is provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent inspection.

7.7. BREATHING AIR QUALITY

Air supply shall be free of harmful quantities of contaminants, and shall meet specification for Grade D Breathing Air as described in the Compressed Gas Association publication G-7 1988, Compressed Air for Human Respiration.

Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus.

Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders must have a dated label or sticker affixed to them indicating "Certified Breathing Air" or equivalent.

Workers are instructed to stop work immediately if they experience difficulty in breathing, smell any unusual odors, or experience an ill feeling such as a headache or upset stomach, etc., and report the situation to their Supervisor.

7.8. USER SEAL CHECKS

Workers shall test the seal of their respirator to their face prior to using by performing both negative-pressure and positive-pressure user seal checks according to the following guidelines.

Negative-pressure seal check procedure:

- Close inlet openings of the respirator, canister(s), cartridge(s), or filter(s) by covering with palm of hands, by replacing the inlet seal on the canister(s), or by squeezing a breathing tube or blocking its inlet so as not to allow the passage of air.
- Inhale gently and hold breath for ten seconds.
- Verify that a satisfactory fit has been achieved by assuring that the facepiece collapses slightly and no inward leakage of air into facepiece is detected.
- If inward leakage is detected the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory fit check is obtained.

Positive-pressure seal check procedure:

- Close exhalation valve or breathing tube or both.
- Exhale gently.
- Verify that a satisfactory fit has been achieved by assuring that a slight buildup of positive pressure is generated inside the facepiece without detection of outward leakage between the sealing surface and the face.
- If outward leakage is detected, the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory seal check is obtained.

8.0 TRAINING

Training is provided to all workers who are required to use respirators, prior to them using the respirator in the workplace.

8.1. TRAINING CONTENT

The training is comprehensive and is to be conducted on an annual basis or more often, if necessary. At a minimum, the training includes the following topics:

- The nature of the hazard(s), including physical properties, odor characteristics, physiological effects on the body, and known concentration levels of toxic material or airborne radioactive level;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The physical characteristics, functional capabilities, and limitations of various types of respirators;
- How to use the respirator in emergency situations;
- How to inspect, don, doff, use, and check the seal of the respirator;
- Procedures for maintenance and storage of the respirator; and
- How to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators.

8.2. TRAINING DOCUMENTATION

Training documentation is maintained for all workers who are assigned work that requires the use of a respirator. (Form 8-1 may be used to document training.)

Re-training is administered annually and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the respirator wearer's knowledge or use of the respirator indicate that the worker has not retained the requisite understanding or skill; or
- Situations arise in which retraining appears necessary to ensure safe respirator use.

Form 8-1 - Air-Supplied Respirator Training

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

I Have Been Trained and Understand	APR (√ as applicable)	SAR (√ as applicable)
The workplace hazards		
Respirator capabilities and limitations		
How improper fit, usage, and maintenance can compromise respirator		
How to use the respirator		
How to use the respirator in an emergency		
How to don, doff, and seal check the respirator		
Cartridge change schedule (APR only)		
How to maintain and store the respirator		
The medical signs and symptoms that may limit effective use of respirator		

APR = Air-Purifying Respirator **SAR** = Supplied Air Respirator

Respirator Description	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	

Person Performing Training: _____

Respirator Wearer's Signature: _____

9.0 RESPIRATOR MAINTENANCE

9.1. CLEANING AND SANITIZATION

The following provides guidelines for cleaning and sanitizing respirators. Recommendations provided by the equipment manufacturer may be used provided the procedures are as effective as those listed here.

Respirators will be cleaned and sanitized before being issued. Commercial wipes may also be used by the wearer to clean his/her respirator between uses during the work shift.

Cleaning, disinfecting, and storage of respirators shall be performed as follows:

- Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand- and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (110 ºF [43 ºC] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm (110 ºF [43 ºC] maximum), preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components will be immersed for 2 minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 110 ºF (43 ºC]);
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6 to 8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 110 ºF (43 ºC); or
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, as recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm (110 ºF [43 ºC] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face-pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- Components are hand-dried with a clean lint-free cloth or air-dried.
- Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- Test the respirator to verify that all components work properly.

Chemical cartridges and mechanical filters shall be discarded and replaced as defined in Section 4.0 of this program.

9.2. INSPECTING AND STORING

Respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

Inspection and replacement of respirator parts shall be performed according to the following:

- All respirators must be inspected by the wearer prior to each use.

- Storage shall be in a convenient, clean, and sanitary location. At a minimum, respirators shall be stored in a protective bag.
- SCBAs shall be inspected monthly and after each use by a qualified person. The wearer shall self-inspect the SCBA prior to each use. SCBA inspections shall include checking cylinder pressure and units shall be brought to the rated pressure. Units shall be recharged after each use.
- Airline respirators shall receive a functional check before and after each use.
- Replacement of parts shall be made only with those specifically designed for the respiratory device used. All maintenance and repair shall be performed only by appropriately trained persons and shall be documented. For some respiratory equipment's maintenance and repairs (e.g., SCBAs, escape units), the manufacturer will provide training certification for the person doing the maintenance or repairs.

9.3. REPAIRING, DISCARDING, AND MAINTAINING RESPIRATORS

Defective equipment shall be immediately removed from service and repaired prior to use. Repairs shall be made only by an appropriately trained, designated qualified person, and only with the manufacturer's approved replacement parts.

Defective equipment not repaired immediately shall be tagged:

Danger — Do Not Use – Defective

Specific defect(s) will be listed on the tag.

Users may self-perform repairs only if they have been appropriately trained and approved parts are available. Reducing and admission valves, regulators, and alarms for air-supplied respirators shall only be repaired by the manufacturer or a certified technician trained by the manufacturer.

10.0 VOLUNTARY RESPIRATOR USE REQUIREMENTS

Workers may voluntarily use a respirator with the approval of their Supervisor. The Site HSE Supervisor and Supervisor will evaluate requests for voluntary respirator use to determine if the worker can perform the activities safely and respirator use will not in itself create a hazard.

If it is determined that voluntary use will be permitted, a copy of Attachment C-2 of this program shall be provided to the worker.

A medical evaluation and PLHCP's written determination will also be provided for all workers who are permitted to use respirators voluntarily, prior to their use of a respirator. (See Section 2.0, Medical Evaluation).

Additionally, all requirements for cleaning, maintaining and storage of respirators contained in this program shall also apply to workers permitted to use respirators voluntarily. (See Section 9.0, Respirator Maintenance.)

Respirators worn on a voluntary basis do not require fit testing.

11.0 RESPIRATOR PROGRAM EVALUATION

The effectiveness of this site-specific Respiratory Protection Program will be evaluated with routine observations and formal program evaluations.

11.1. ROUTINE OBSERVATIONS

The Site HSE Supervisor shall be responsible for conducting routine observations related to the effective selection, use, maintenance, storage and other aspects of this program. Observations shall be noted through the use of SORs or equivalent documented routine safety inspections. Noted deficiencies shall be corrected as soon as possible.

11.2. PROGRAM EVALUATIONS

Formal program evaluations shall be conducted on an annual basis and documented on Respiratory Protection Program Checklist (Attachment C-3). SORs and SERs can also be used to document program effectiveness.

Noted deficiencies are corrected as soon as possible.

11.3. CONTENT OF PROGRAM EVALUATIONS

Program evaluations shall conform to the following:

- Program administration
- Medical evaluations of employees required to use respirators
- Procedures for selecting respirators for use in the workplace
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Initial and annual fit testing for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Procedures for regularly evaluating the effectiveness of the program
- Voluntary use procedures
- Other applicable observations

ATTACHMENTS

Attachment C-1 OSHA Respirator Medical Evaluation Questionnaire

Attachment C-2 Employees Using Respirators When Not Required Under the Standard

Attachment C-3 Respiratory Protection Program Checklist

Attachment C-4 NIOSH Respirator Selection Logic Sequence - 2004

Attachment C-5 Definitions

ATTACHMENT C-1
OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE

TO THE EMPLOYER: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

TO THE EMPLOYEE: Can you read: ☐ Yes ☐ No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

PART A. SECTION 1. **(Mandatory)** The following information must be provided by every employee who has been selected to use any type of respirator. (Please Print)

Today's Date:_____ Location/Job #:_____

Your Name: _____ DEN/SSN:_____

Your Age (to nearest year): _____ Sex: ☐ Male ☐ Female

Your Height: _____ft. _____in. Your Weight: _____lbs.

Your Job Title: _____

A phone number where you can be reached by the health care professional who reviews this questionnaire.

(Include the area code):_____

The best time to reach you at this number: _____ AM / PM

Has your employer told you how to contact the health care professional who will review this questionnaire?

☐ Yes ☐ No

Check the type of respirator you will use (you can check more than one category):

☐ N, R, or P disposable respirator (filter mask, non-cartridge type only).

☐ Other type (for example, half- or full-face piece type, powered-air purifying, supplied air, self-contained breathing apparatus).

Have you ever worn a respirator? ☐ Yes ☐ No

If yes, what type(s)? _____

Have you ever failed a respirator examination or pulmonary function test? ☐ Yes ☐ No

If yes, why? _____

Have you ever been denied or turned down for the use of a respirator? ☐ Yes ☐ No

If yes, why? _____

PART A. SECTION 2. **(Mandatory)** Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator.

Name: _____

1. Do you **currently** smoke tobacco, or have you smoked tobacco in the last month? If **YES**, how long have you smoked? _____ What do you smoke? ☐ Cigarettes ☐ Cigars ☐ Pipe tobacco How much do you smoke per day? _____ If **NO**, are you a former smoker? ☐ Yes ☐ No How long since you quit? _____ How many years did you smoke? _____ How much did you smoke per day? _____	☐ Yes ☐ No
2. Have you **ever** had any of the following conditions?	
A. Seizures (fits)	☐ Yes ☐ No
B. Diabetes (sugar disease)	☐ Yes ☐ No
C. Allergic reactions that interfere with your breathing	☐ Yes ☐ No
D. Claustrophobia (fear of closed-in places)	☐ Yes ☐ No
E. Trouble smelling odors	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	
3. Have you **ever** had any of the following pulmonary or lung problems?	
A. Asbestosis	☐ Yes ☐ No
B. Asthma	☐ Yes ☐ No
C. Chronic bronchitis	☐ Yes ☐ No
D Emphysema	☐ Yes ☐ No
E. Pneumonia	☐ Yes ☐ No
F Tuberculosis	☐ Yes ☐ No
G. Silicosis	☐ Yes ☐ No
H. Pneumothorax	☐ Yes ☐ No
I. Lung cancer	☐ Yes ☐ No
J. Broken ribs	☐ Yes ☐ No
K. Any chest injuries or surgeries	☐ Yes ☐ No
L. Any other lung problem that you have been told about	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

4. Do you **currently** have any of the following symptoms of pulmonary or lung diseases?	
A. Shortness of breath	☐ Yes ☐ No
B. Shortness of breath when walking fast on level ground or walking up a slight hill or incline	☐ Yes ☐ No
C. Shortness of breath when walking with other people at an ordinary pace on level ground	☐ Yes ☐ No
D. Have to stop for a breath when walking at your own pace on level ground	☐ Yes ☐ No
E. Shortness of breath when washing or dressing yourself	☐ Yes ☐ No
F. Shortness of breath that interferes with your job	☐ Yes ☐ No
G. Coughing that produces phlegm (thick sputum)	☐ Yes ☐ No
H. Coughing that wakes you early in the morning	☐ Yes ☐ No
I. Coughing that occurs mostly when you are lying down	☐ Yes ☐ No
J. Coughing up blood in the last month	☐ Yes ☐ No
K. Wheezing	☐ Yes ☐ No
L. Wheezing that interferes with your job	☐ Yes ☐ No
M. Chest pain when you breathe deeply	☐ Yes ☐ No
N. Any other symptoms that you think may be related to lung problems	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	
5. Have you **ever** had any of the following cardiovascular or heart problems?	
A. Heart attack	☐ Yes ☐ No
B. Stroke	☐ Yes ☐ No
C. Angina	☐ Yes ☐ No
D. Heart failure	☐ Yes ☐ No
E. Swelling in your legs or feet (not caused by walking)	☐ Yes ☐ No
F. Heart arrhythmia (heart beating irregularly)	☐ Yes ☐ No
G. High blood pressure	☐ Yes ☐ No
H. Any other heart problem that you have been told about	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

6. Have you **ever** had any of the following cardiovascular or heart symptoms? A. Frequent pain or tightness in your chest B. Pain or tightness in your chest during physical activity C. Pain or tightness in your chest that interferes with your job D. In the past 2 years, have you noticed your heart skipping or missing a beat E. Heartburn or indigestion that is not related to eating F. Any other symptoms that you think may be related to heart or circulation problems Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
7. Do you **currently** take medication for any of the following problems? A. Breathing or lung problems B. Heart trouble C. Blood pressure D. Seizures (fits) If **YES**, list medications and dosages: _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
8. If you have used a respirator, have you **ever** had any of the following problems? (If you have never used a respirator, check the box and go to question 9) ☐ A. Eye irritation B. Skin allergies or rashes C. Anxiety D. General weakness or fatigue E. Any other problem that interferes with you use of a respirator Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
9. Would you like to talk to the health care professional that will review this questionnaire about your answers on this questionnaire?	☐ Yes ☐ No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10.	Have you **ever** lost vision in either eye (temporarily or permanently)? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
11.	Do you **currently** have any of the following vision problems? A. Wear contact lenses B. Wear glasses C. Color blind D. Any other eye or vision problem Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
12.	Have you **ever** had an injury to your ears, including a broken eardrum? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
13.	Do you **currently** have any of the following hearing problems? A. Difficulty hearing B. Wear a hearing aid C. Any other hearing or ear problem Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No

14.	Have you **ever** had a back injury? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
15.	Do you **currently** have any of the following musculo-skeletal problems?	
	A. Weakness in any part of your arms, hands, legs, or feet	
	B. Back pain	☐ Yes ☐ No
	C. Difficulty fully moving your arms and legs	☐ Yes ☐ No
	D. Pain or stiffness when you lean forward or backward at the waist	☐ Yes ☐ No
	E. Difficulty fully moving your head up or down	☐ Yes ☐ No
	F. Difficulty fully moving your head side to side	☐ Yes ☐ No
	G. Difficulty bending at your knees	☐ Yes ☐ No
	H. Difficulty squatting to the ground	☐ Yes ☐ No
	I. Climbing a flight of stairs or a ladder carrying more than 25 pounds	☐ Yes ☐ No
	J. Any other muscle or skeletal problem that interferes with using a respirator	☐ Yes ☐ No
	Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

PART B: Discretionary Questions. Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1.	In your **present** job, are you working at high altitudes (over 5,000 feet) or in a place that that has lower than normal amounts of oxygen? If **YES**, do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions? Explain below: _____ _____ _____ _____	☐ Yes ☐ No
2.	At work or at home, have you **ever** been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals? If **YES**, name the chemicals if you know them: _____ _____ _____ _____	☐ Yes ☐ No
3.	Have you **ever** worked with any of the materials, or under any of the conditions, listed below: A. Asbestos B. Silica (e.g., in sandblasting) C. Tungsten / cobalt (e.g., grinding or welding this material) D. Beryllium E. Aluminum F. Coal (e.g., mining) G. Iron H. Tin I. Dusty environments J. Any other hazardous exposures If **YES**, describe these exposures: _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No

4.	List any previous occupations: _____ _____ _____ _____	
5.	List your current and previous hobbies: _____ _____ _____ _____	
6.	List any second jobs or side businesses you have: _____ _____ _____ _____	
7.	Have you been in the military services? If **YES**, were you exposed to biological or chemical agents (either in training or combat): If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No
8.	Have you ever worked on a HAZMAT team? If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No
9.	Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications)? If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No

10.	Will you be using any of the following items with your respirator(s)? A. High Efficiency Particulate Air (HEPA) Filters B. Canisters (For example, gas masks) C. Cartridges	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
11.	How often are you expected to use the respirator(s)? A. Escape only (no rescue) B. Emergency rescue only C. Less than 5 hours per week D. Less than 2 hours per day E. 2 to 4 hours per day F. Over 4 hours per day	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
12.	During the period you are using the respirator(s), is your work effort: A. Light (less than 200 kilocalories [kcal] per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.* B. Moderate (200 to 350 kcal per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of moderate work are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5 degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs) on a level surface.* C. Heavy (above 350 kcal per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of heavy work are lifting a heavy load (about 50 lbs) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8 degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs).*	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
13.	Will you be wearing protective clothing and/or equipment (other than the respirator) when you are using your respirator? If **YES**, please describe this protective clothing and/or equipment: _____ _____ _____ _____	☐ Yes ☐ No
14.	Will you be working under hot conditions (temperature of 77 ºF)?	☐ Yes ☐ No
15.	Will you be working under humid conditions?	☐ Yes ☐ No

16.	Describe the work you will be doing while you are using your respirator: _____ _____ _____ _____
17.	Describe any special or hazardous conditions you might encounter when you are using your respirator(s) (for example, confined spaces, life-threatening gases): _____ _____ _____ _____
18.	Provide the following information, if you know it, for each toxic substance that you will be exposed to when you are using your respirator(s): A. Name of the first toxic substance: _____ B. Estimated maximum exposure level per shift: _____ C. Duration of exposure per shift: _____ D. Name of the second toxic substance: _____ E. Estimated maximum exposure level per shift: _____ F. Duration of exposure per shift: _____ G. Name of the third toxic substance: _____ H. Estimated maximum exposure level per shift: _____ I. Duration of exposure per shift: _____ J. The name of any other toxic substances that you will be exposed to while using your respirator: _____ _____ _____ _____
19.	Describe any special responsibilities you will have while using your respirator(s) that may affect the safety and well-being of others (e.g., rescue, security): _____ _____ _____ _____
DATE: _____ SIGNATURE: _____	

ATTACHMENT C-2
EMPLOYEES USING RESPIRATORS WHEN NOT REQUIRED UNDER THE STANDARD

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker.

Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA or other applicable regulations or standards.

If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following.

1. Read and follow all instructions provided by the manufacturer on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern; in the United States, NIOSH respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is tested and certified for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

ATTACHMENT C-3
RESPIRATORY PROTECTION PROGRAM CHECKLIST

Site Name: _____ Location: _____

Site Manager: _____ Site HSE Supervisor: _____

Reviewer:_____ Date Reviewed: _____

PROGRAM ADMINISTRATION

Yes	No	
☐	☐	Are the Program Administrator and Site HSE Supervisor identified?
☐	☐	Are the nine program elements followed?
☐	☐	If program include emergency respirator use, are procedures in place?
☐	☐	Is the Site HSE Supervisor effectively administering the program?
☐	☐	Is the written program updated as necessary to account for changes in the workplace affecting respirator use?
☐	☐	Equipment, training, and medical evaluations provided at no cost to employees?

Comments: _____

_____

MEDICAL EVALUATION

Yes	No	
☐	☐	All employees in respirator jobs have been evaluated to determine their ability to wear a respirator prior to respirator use.
☐	☐	A PLHCP has been identified to perform the medical evaluations.
☐	☐	Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in the medical questionnaire for respiratory use in Attachment C-1, or if their initial medical evaluation reveals that a follow-up exam is needed.
☐	☐	Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.
☐	☐	Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.
☐	☐	Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and the PLHCP has given the employee a copy of these recommendations.
☐	☐	Employees who are medically unable to wear a negative pressure respirator are provided with a PAPR if they are found by the PLHCP to be medically able to use a PAPR.
☐	☐	Employees are given additional medical evaluation when: • The employee reports symptoms related to his or her ability to use a respirator. • The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary. • Information from the respiratory protection program suggests a need for reevaluation. • Workplace conditions have changed in a way that could potentially cause increased risk to the employee's health.

Comments: _____

_____

RESPIRATOR SELECTION

Yes	No	
☐	☐	The specific hazards for each respiratory protection task have been identified.
☐	☐	Respirators are NIOSH certified, and used under the conditions of the certification.
☐	☐	Respiratory job exposures characterized as routine or incident-related.
☐	☐	Respirator job exposures are evaluated for IDLH exposure potential.
☐	☐	Estimated exposure concentration is included for tasks with routine exposures.
☐	☐	Respirator manufacturer and model information are specified for each respirator job.
☐	☐	A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.
☐	☐	For IDLH jobs, full facepiece pressure demand SAR with escape cylinder or full face piece pressure demand SCBAs, with a minimum service life of 30 minutes, are provided.
☐	☐	Respirators used for escape only are NIOSH certified for the atmosphere in which they will be used.
☐	☐	Oxygen deficient atmospheres are considered IDLH.
☐	☐	Respirators selected are appropriate for the chemical state and physical form of the contaminant.
☐	☐	APRs used for protection against gases and vapors are equipped with end-of-service-life indicators or a change schedule has been specified and implemented.
☐	☐	APRs used for protection against particulate are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulate.
☐	☐	APRs used for routine gas and vapor exposure protection have service life documentation using manufacturer software, attached to program.

Comments: _____

_____

FIT TESTING

Yes	No	
☐	☐	All employees who are using tight fitting respirator facepieces have passed an appropriate fit test prior to being required to use a respirator.
☐	☐	Fit testing is conducted with the same make, model, and size of respirator that the employee will be expected to use at the worksite.
☐	☐	Fit tests are conducted annually and when different respirator facepieces are to be used.
☐	☐	Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.
☐	☐	Employees are given the opportunity to select a different respirator facepiece, and be retested, if their respirator fit is unacceptable to them.
☐	☐	Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.
☐	☐	QNFT is used in all situations where a negative pressure respirator is intended to protect workers from contaminant concentrations greater than 10 times the PEL.

Yes	No	
☐	☐	For tight-fitting respirators and PAPR: • All tests are conducted in the negative pressure mode. • QLFT is achieved by temporarily converting the facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure APR.
☐	☐	QNFT is achieved by modifying the facepiece with an adaptor to allow for sampling inside the mask midway between the nose and mouth. The facepiece is restored to its approved configuration before being used in the workplace.

Comments: _____

_____

PROPER RESPIRATOR USE

Yes	No	
☐	☐	Workers using tight-fitting respirators have no conditions, such as facial hair, that would interfere with a face-to-facepiece seal or valve function.
☐	☐	Workers wear corrective glasses, goggles, or other protective equipment in a manner that does not interfere with the face-to-facepiece seal or valve function.
☐	☐	Workers perform user seal checks prior to each use of a tight-fitting respirator.
☐	☐	Procedures are in place for conducting ongoing surveillance of the work area for conditions that affect respirator effectiveness, and when such conditions exist, are taken to address those situations.
☐	☐	Employees are permitted to leave their work area to conduct respirator maintenance, such as washing the facepiece, or to replace respirator parts.
☐	☐	Employees do not return to their work area until their respirator has been repaired or replaced in the event of breakthrough, a leak in the facepiece, or a change in breathing resistance.
☐	☐	There are procedures for respirator use in IDLH atmospheres to ensure that the appropriate number of standby personnel are deployed; standby personnel and employees in the IDLH environment maintain communication; standby personnel are properly trained, equipped, and prepared; the Site HSE Supervisor is notified when standby personnel enter an IDLH atmosphere; and the Site HSE Supervisor will respond to the notification.
☐	☐	Standby personnel are equipped with a pressure demand or other positive pressure. SCBA, or a positive pressure supplied air respirator with an escape bottle, and appropriate retrieval equipment or other means for rescue.

Comments: _____

_____

TRAINING AND INFORMATION

Yes	No	
☐	☐	Employees can demonstrate knowledge of the following: • Why the respirator is necessary and the consequences of improper fit, use, or maintenance. • Limitations and capabilities of the respirator. • How to effectively use the respirator in emergency situations. • How to inspect, don, doff, use, and check the seals of the respirator. • Maintenance and storage procedures.
☐	☐	Training is provided prior to employee use of a respirator.

Yes	No	
☐	☐	Retraining is provided: • Annually. • Upon changes in workplace conditions that affect respirator use. • Whenever retraining appears necessary to verify safe respirator use. • Respirator voluntary use requirements are provided to voluntary users.

Comments: _____

_____

RESPIRATOR MAINTENANCE AND CARE

Cleaning and Disinfecting

Yes	No	
☐	☐	Respirators are provided that are clean, sanitary, and in good working order.
☐	☐	Respirators are cleaned and disinfected as often as necessary when issued for the exclusive use of one employee; before being worn by different individuals; after each use for emergency use respirators; and after each use for respirators used for fit testing. Commercially available mild detergents or cleaner/sanitizer recommended by the manufacturer are used.

Storage

Yes	No	
☐	☐	Respirators are stored to protect them from damage from the elements, and from becoming deformed.
☐	☐	Emergency respirators are stored, to be accessible to the work area, in compartments marked as such, and in accordance with manufacturer's recommendations.

Inspections

Yes	No	
☐	☐	Routine-use respirators are inspected before each use and after cleaning.
☐	☐	SCBAs and emergency respirators are inspected monthly and checked for proper function before and after each use.
☐	☐	Emergency escape only respirators are inspected before being carried into the workplace for use.
☐	☐	Inspections include: check of respirator function; tightness of connections; condition of the facepiece, head straps, valves, cartridges, and condition of elastomeric parts.
☐	☐	For SCBAs, inspection includes checking that cylinders are fully charged, and that regulators and warning devices function properly.
☐	☐	Emergency use respirators are inspected. The inspection documentation is attached to the respirator or its compartment, or stored with inspection reports.
☐	☐	Respirators that have failed inspection are taken out of service.

Repairs

Yes	No	
☐	☐	Repairs are made only by trained personnel.
☐	☐	Only NIOSH-approved parts are used.
☐	☐	Reducing and admission valves, regulators and alarms are adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Comments: _____

_____

BREATHING AIR QUALITY AND USE

General

Yes	No	
☐	☐	Compressed breathing air meets the requirements for Grade D breathing air.
☐	☐	Compressed oxygen is not used in respirators that have previously used compressed air.
☐	☐	Oxygen concentrations greater that 23.5% are used only in equipment designed for oxygen service or distribution.
☐	☐	Breathing air couplings are incompatible with outlets for other gas systems.
☐	☐	Breathing gas containers are marked with appropriate NIOSH certification.

Breathing Air Cylinders

Yes	No	
☐	☐	Breathing air cylinders are tested and maintained according to DOT 49 CFR Part 173 and 178.
☐	☐	A certificate of analysis for breathing air has been obtained from the supplier.
☐	☐	Moisture content in the cylinder breathing air does not exceed a dew point of -500 °F at 1 atmosphere pressure.

Air Compressors

Yes	No	
☐	☐	Are constructed and situated to prevent contaminated air from getting into the system and are set up to minimize the moisture content.
☐	☐	Are equipped with in-line air-purifying sorbent beds and/or filters that are maintained or replaced following manufacturer's instructions and are tagged with information on the most recent change date of the filter and an authorizing signature.
☐	☐	Carbon monoxide does not exceed 10 ppm in the breathing air from compressors that are oil-lubricated, and high-temperature and carbon monoxide alarms are used on oil-lubricated compressors, or the air is monitored often enough to verify that carbon monoxide does not exceed 10 ppm if only a high-temperature alarm is used.

Comments: _____

_____

PROGRAM EVALUATION

Yes	No	
☐	☐	Workplace evaluations are being conducted to verify that the written respiratory protection program is being effectively implemented.
☐	☐	Employees required to wear respirators are being regularly consulted to assess the employees' views and to identify problems with respirator fit, selection, use and maintenance.
☐	☐	Any problems identified during evaluations are corrected.

RECORDKEEPING

Yes	No	
☐	☐	Records of medical evaluations are being retained for the term of employment plus 30 years.
☐	☐	Fit testing records are being retained for 1 year.
☐	☐	A copy of the current respiratory protection program has been retained onsite.
☐	☐	Access to these records is provided to workers.

Comments: _____

_____

CORRECTIVE ACTIONS REQUIRED

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ATTACHMENT C-4
NIOSH RESPIRATOR SELECTION LOGIC SEQUENCE - 2004

To use this selection logic, first assemble the necessary toxicologic, safety, and other relevant information for each respiratory hazard, as follows:

- General use conditions
- Physical, chemical, and toxicological properties of the contaminants
- Occupational Exposure Limit (Short-Term Exposure Limit [STEL], recommended exposure limit, PEL, TLV)
- Expected concentration of each respiratory hazard
- IDLH concentration
- Oxygen concentration or expected oxygen concentration
- Eye irritation potential
- Environmental factors such as presence of oil aerosols

General use conditions should include a description of the job task, including the duration and frequency, location, physical demands, industrial processes, and issues affecting the comfort of the respirators.

After all criteria have been identified and evaluated and after the requirements and restrictions of the respiratory protection program have been met, follow this sequence of questions to identify the class of respirators that should provide adequate respiratory protection. If there exist site contaminants with a substance-specific standard, respirator selection must meet or exceed the respirators required in that standard.

Step 1 Is the respirator intended for use during fire fighting?

a. If yes, only a full-facepiece, pressure-demand, SCBA meeting the requirement of the National Fire Protection Association 1981, Standard on Open-circuit Self-contained Breathing Apparatus for Fire and Emergency Services (2002 edition) is required.

b. If no, proceed to Step 2.

Step 2 Is the respirator intended for use in an oxygen-deficient atmosphere, i.e., less than 19.5% oxygen?

a. If yes, any type of SCBA other than escape only, or SAR with an auxiliary SCBA is required. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
If yes, and contaminants are also present, proceed to Step 3 to determine if the hazard requires the SCBA or SAR/SCBA to meet a specific APF level.

b. If no, proceed to Step 3.

Step 3 Is the respirator intended for entry into unknown or IDLH atmospheres (e.g., an emergency situation)?

a. If yes, one of two types of respirators is required: a pressure-demand SCBA with a full facepiece or a pressure-demand SAR with a full facepiece in combination

with an auxiliary pressure-demand SCBA. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.

b. If no, proceed to Step 4.

Step 4 Is the exposure concentration of each of the contaminants, as determined by acceptable industrial hygiene methods, less than its respective exposure limit?

a. If yes, a respirator is not required for routine work. For escape respirators, determine the potential for generation of a hazardous condition caused by an accident, spill, or equipment failure. Proceed to Step 6.

b. If no, proceed to Step 5.

Step 5 Are conditions such that a worker who is required to wear a respirator can escape from the work area and not suffer loss of life or immediate or delayed irreversible health effects if the respirator fails, i.e., are the conditions not IDLH?

a. If yes, conditions are not considered to be IDLH. Proceed to Step 6.

b. If no, conditions are considered to be IDLH. See Section 5.0 for further guidance.

Step 6 Is the contaminant an eye irritant, or can the contaminant cause eye damage at the workplace concentration?

a. If yes, a respirator equipped with a full facepiece, helmet, or hood is required. Proceed to Step 7.

b. If no, a half-mask or quarter-mask respirator may still be an option, depending on the exposure concentration. Proceed to Step 7.

Step 7 Determine the maximum hazard ratio by the following:

- Divide the time-weighted average (TWA) exposure concentration for the contaminant determined in Step 4 by the applicable exposure limit. If the exposure limit is an 8-hour limit, the TWA used must be an 8-hour average. If the exposure limit is based on 10 hours, use a 10-hour TWA.
- If the contaminant has a ceiling limit, divide the maximum exposure concentration for the contaminant determined in Step 4 by the ceiling limit.
- If the contaminant has an STEL, divide the maximum 15-minute TWA exposure concentration for the contaminant determined in Step 4 by the STEL.
- For escape respirators, determine the potential for generation of a hazardous condition caused by an accident or equipment failure.

If the calculated maximum hazard ratio is greater than 1, proceed to Step 8.

Step 8 If the physical state of the contaminant is:

- A particulate (solid or liquid aerosol) during periods of respirator use, proceed to Step 9;
- A gas or vapor, proceed to Step 10; or
- A combination of gas or vapor and particulate, proceed to Step 11.

Step 9 Particulate Respirators

Is the particulate respirator intended only for escape purposes?

The maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

For multi-component mixtures the MUC can be calculated by:
C1/MUC1 + C2/MUC2 +…Cn/MUCn= 1

The MUC for the selected respirator class must exceed the expected contaminant concentration.

Step 10 Gas/Vapor Respirators

10.1 Is the gas/vapor respirator intended only for escape?

a. If yes, refer to escape respirators.

b. If no, the gas/vapor respirator is intended for use during normal work activities. Proceed to Step 10.2.

10.2 An air-purifying chemical cartridge/canister respirator that has a sorbent suitable for the chemical properties of the anticipated gas/vapor contaminant(s) and for the anticipated exposure levels is required. Information on cartridges or canisters approved for use for classes of chemicals or for specific gases or vapors can be found in the NIOSH Certified Equipment List http://www.cdc.gov/NIOSH/npptl/topics/respirators/cel/. Proceed to Step 10.3.

10.3 Respirators that have not been eliminated from Table 2 by the previous steps and that have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7 are required. Note, however, that the MUC is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
$/C_1/MUC_1 + C_2/MUC_2 + \ldots C_n/MUC_n = 1$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from Table 2.

Step 11 Combination Particulate and Gas/Vapor Respirators

11.1 Is the combination respirator intended for "escape only" purposes?

a. If yes, refer to the section on escape respirators, for a discussion and selection of "escape only" respirators.

b. If no, the combination respirator is intended for use during normal work activities. Proceed to Step 11.2.

11.2 From Table 3, select a respirator type, not eliminated by the previous steps, and have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7. Note, however, that the MUC is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)
- The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
C1/MUC1 + C2/MUC2 +…Cn/MUCn= 1

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from Table 3.

Table 1 - Respirator Assigned Protection Factors–Particulate

Respirator Type	APF-NIOSH	APF-OSHA
Quarter mask	5	5
Air-purifying half-mask with appropriate type of particulate filter[1]	10	10
Air-purifying full facepiece with appropriate type of particulate filter	10	50
Air-purifying full facepiece with N-100, R-100, or P-100 filter.	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet and HEPA filter	25	25/1,000[2]
Powered air purifying with loose fitting facepiece		25
Powered air-purifying with tight-fitting facepiece (half-mask) and high efficiency filter	50	50
Powered air-purifying with tight-fitting full facepiece and high efficiency filter	50	1,000 ??
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with tight fitting half-mask facepiece	50	50
Continuous flow supplied-air with tight fitting full facepiece	50	1,000
Continuous flow supplied-air with loose fitting facepiece		25
Pressure-demand supplied air with half-mask	1,000	50
Pressure-demand supplied air with full facepiece	2,000	1,000
Pressure-demand self-contained with full facepiece [3]	10,000	10,000
Pressure-demand self-contained with helmet/hood		10,000

Notes:

[1] Includes elastomeric facepiece and filtering facepiece.

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

Table 2 - Respirator Assigned Protection Factors–Gas/Vapor

Respirator Type	APF-NIOSH	APF-OSHA
Air-purifying half-mask with appropriate type of gas/vapor cartridge[1]	10	10
Air-purifying full facepiece with appropriate type of gas/vapor cartridge	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet with appropriate type of gas/vapor cartridge	25	25/1,000[2]
Powered air purifying with loose fitting facepiece		25
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) and appropriate gas/vapor cartridge	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) and appropriate gas/vapor cartridge	50	1,000
Negative pressure (demand) self-contained with half mask.		10
Negative pressure (demand) self-contained with full facepiece	50	50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece[3]	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

Notes:

[1] Includes elastomeric facepiece.

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

Table 3 - Respirator Protection Factors–Gas/Vapor and Particulate Combination

Respirator Type	APF-NIOSH	APF-OSHA
Air-purifying half-mask equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	10
Air-purifying full facepiece equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	1,000
Powered air purifying with loose fitting facepiece		25
Negative pressure (demand) self-contained with full facepiece	50	50
Negative pressure (demand) self-contained with half-mask		10
Negative pressure (demand) self-contained with helmet/hood		50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece[3]	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

Notes:

1 Includes elastomeric facepiece.

2 Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

3 May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

ATTACHMENT C-5
DEFINITIONS

Administrative Controls	Methods of controlling employee exposures to contaminants by job rotation, work assignment, or time periods away from the contaminant.
Air-purifying respirator	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
Atmosphere-supplying respirator	A respirator that supplies the users with breathing air from a source independent of the ambient atmosphere, and includes Supplied-Air Respirators (SAR) and Self-Contained Breathing Apparatus (SCBA) units.
Canister or cartridge	A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Dust	Dry particulate aerosols generated by handling, crushing, or grinding organic or inorganic material. Particle size ranges from 1 micrometer (µm) to 1 millimeter diameter.
Emergency situation	Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.
End-of-service-life indicator	A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.
Engineering Controls	Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment.
Escape-only respirator	A respirator intended to be used only for emergency exit.
Filter or air purifying element	A component used in respirators to remove solid or liquid aerosols from the inspired air.
Filter facepiece (dust mask)	A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
Fume	Aerosol particles generated from heating a solid material. These particles range in diameter from 0.001 to 1 µm.
Gas	A state of matter in which the material has very low density and viscosity, can expand and contract in response to changes in temperature and pressure, easily diffuses into other gases, and that uniformly distributes throughout any container.
High Efficiency Particulate Air (HEPA) filter	A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 µm or greater in diameter. The equivalent NIOSH particulate filters are the N100, R100, and P100 filters.
Hood	A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
Immediately Dangerous to Life or Health (IDLH)	An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Mist	Suspended droplet aerosols produced from bulk liquids by mechanical processes such as splashing, bubbling, or spraying. Particle sizes range from 0.01 to 10 µm in diameter.
Negative pressure respirator (tight fitting)	A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
Oxygen deficient atmosphere	An atmosphere with an oxygen content below 19.5%.
Positive pressure respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
Pressure-demand respirator	A supplied-air respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
Powered Air Purifying Respirator (PAPR)	An air purifying respirator that uses a blower to force the ambient air through air purifying elements to the inlet covering.
Pressure demand respirator	A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
Qualitative Fit Test (QLFT)	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
Quantitative Fit Test (QNFT)	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
Radionuclides	An atom capable of spontaneously emitting radiation.
Respiratory inlet covering	That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air purifying device or breathing air source, or both. It may be a facepiece, helmet, hood suit, or mouthpiece respirator with nose clamp.
Self-Contained Breathing Apparatus (SCBA)	A supplied-air respirator for which the breathing air source is designed to be carried by the user.
Supplied-Air Respirator (SAR) or airline respirator	A supplied-air respirator for which the source of breathing air is not designed to be carried by the user.
Tight fitting facepiece	A respiratory inlet covering that forms a complete seal with the face.
User seal check	An action conducted by the respirator user to determine if the respirator is properly seated to the face.
Vapor	The gaseous form of a substance, which is at equilibrium with its liquid or solid state.

APPENDIX D

FORMS

Certificate of Worker/Visitor Acknowledgement (Form 078)
Completion of Supervised Field Experience (Form 080)
Confined Space Entry Assessment and Permit (Form 073)
Cutting, Welding, Open Flame, and Spark Production Permit (TVA 6561a)
Daily Job Safety Analysis (Form 086)
Direct Read Air Monitoring Record (Form 075)
Emergency Response Best Practice (Form 076)
Excavation and Trenching Permit (Form 041)
Excavation Permit (TVA 29205)
Float Plan (Form 057)
Instrument Calibration Log (Form 072)
Integrated Air Monitoring Record (Form 077)
Job Safety Analysis (TVA 15943)
Job Safety Analysis Surveillance Pocket Card (Form 060)
Lift Plan (Form 074)
PPE Downgrade Rationale (Form 079)
Safety Coaching Visit Checklist (Form 020)
Safety Observation Report (Form 061)
Safety Observation Report Pocket Card (Form 061A)
Site Tailgate Meeting (Form 081)
Task Managed Contractor Preliminary Incident / Injury Report (TVA 20260)
Visitor Orientation (Form 082)
Wet Bulb Globe Thermometer (WBGT) Readings (Form 083)
Hazard Level-Based ES&H Corrective Actions Tracking Report (Form 084)
Work Zone Classification Change Notice (Form 085)

Kingston Ash Recovery Project

CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

CONTRACTOR'S NAME: _____

EMPLOYEE'S NAME: _____

The contract for the above project requires the following: that you be provided with and complete formal and site specific training; that you be supplied with proper personal protective equipment including respirators (as needed); that you be trained in its use; and that when necessary, you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE BEEN BRIEFED ON, UNDERSTAND AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN. I HAVE ALSO BEEN GIVEN THE SITE WIDE SAFETY AND HEALTH PLAN BOOKLET.

Signature: Date:

_____ _____

SITE SPECIFIC TRAINING: I have been provided and have completed the site specific training required by this Contract. The Site Safety and Health Officer conducted the training.

RESPIRATORY PROTECTION: ☐ I have ☐ Have not at this time, been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I wear. I have been trained in and will abide by the facial hair policy.

RESPIRATOR FIT TEST TRAINING: ☐ I have ☐ Have not at this time, been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will wear. I have been fit tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit check upon donning negative pressure respirators each time.

Kingston Ash Recovery Project

COMPLETION OF SUPERVISED FIELD EXPERIENCE

Date:_____

I certify the following individuals have completed their 24 hours of supervised field experience at the TVA Fly Ash Response Site per the requirements of 29 CFR 1910.120:

NAME	COMPANY	POSITION

Supervisor Company: _____

Supervisor Name: _____

Supervisor Signature: _____

Kingston Ash Recovery Project

CONFINED SPACE ENTRY ASSESSMENT AND PERMIT

Date:	Confined Space Name/Location:
Confined Space Entry Supervisor:	Describe Tasks Involved:

SECTION I — ASSESSMENT				
Hazards Identified	**Y**	**N**	**NA**	**Detail of Hazard and Appropriate Control**
ISOLATION HAZARDS				
Access points to space labeled ”Danger, Permit-Required Confined Space, Do Not Enter”				
Access points to space protected with barrier tape, barricades, or fencing				
Lines and tanks flushed, purged, and clean				
Blanks installed				
Electrical lock-out/tag-out installed and tested				
Mechanical lock-out/tag-out installed and tested				
Radioactive source removed or shielded				
PHYSICAL HAZARDS				
Ladders, scaffolds, work platforms safeguarded				
Fall protection required				List fall protection equipment under PPE section
Walking and working areas dry and clean				
Minimum illumination of 5 foot-candles				
Continuous audio or visual communication				Identify communication method used
ATMOSPHERIC/CHEMICAL HAZARDS				
Identify and measure all chemical hazards in the confined space				
High pressure				
High temperature or heat stress				
Chemicals generated due to work processes				
Burning, cutting, welding controlled				Specify method: Mechanical ventilation or respiratory protection
Hazardous materials in surface coating (lead, etc.)				Identify the hazardous material
Possibility of toxic/ inert gases leaking/sinking in				
Continuous Atmospheric Monitoring required				Complete Continuous Atmospheric Testing Section
Mechanical ventilation required				Calculate air changes per hour required
Respiratory protection required				List respiratory protection in PPE Section
Supplied air or self contained air required				
Asbestos disturbed				
Potential IDLH				SCBA or airline respirator, and retrieval harness required
ELECTRICAL HAZARDS				
All equipment bonded, grounded and tested				
GFCIs for all electrical equipment				
All equipment explosion proof/ intrinsically safe				
Work Activities				
Permits required: Hot Work, Excavation, etc.				Identify permits
Hazardous work activities in surrounding areas				
Other hazards not listed above				
PPE (Describe all required PPE including retrieval equipment and harnesses.)				
Eye Protection				
Protective Clothing				
Hand and Foot Protection				
Respiratory Protection				
Fall Protection				

SECTION II — PERMIT

This confined space permit is valid only for the work, location, and time listed. If changes occur, the confined space must be re-evaluated and the permit re-issued. All hazards listed in the Assessment and Permit Section must be addressed in the SPA.

Oxygen 20.8% (19.5 - 23.5%)	☐ Yes ☐ No	If oxygen is < or > 20.8%, determine why
Combustible gas concentration < 1 % LEL	☐ Yes ☐ No	
Carbon monoxide < 25 ppm	☐ Yes ☐ No	
Carbon dioxide < 1,000 ppm	☐ Yes ☐ No	
Hydrogen sulfide < 10 ppm	☐ Yes ☐ No	

List other Chemicals	Monitoring Levels and Action Levels	Exposure Limits (PEL, TLV, etc.)

For non-continuous atmospheric testing, state type of testing, calibration dates, and monitoring frequency.

For continuous atmospheric testing, list monitoring instruments and calibration dates.

Has rescue plan been assembled and practiced? ☐ Yes ☐ No

List name of emergency rescue service and identify the equipment that will be used to summon rescue service.

Printed Names of Trained Entrants	**Printed Names of Trained Attendants**	
Printed Name of Entry Supervisor		
Entry Supervisor's Signature	Date	Time
HSE Supervisor's (or Project/Site Manager) Signature	Date	Time

SECTION III — CLOSURE

After confined space entry is complete, the supervisor shall record in this space any incidents and actions taken and any lessons learned.

Supervisor Closure Signature	Date and Time of Permit Closure

CONFINED SPACE AUTHORIZED ENTRANTS SIGN-IN AND SIGN-OUT LOG

Client:	Project:	Location:	Date:
Name/Description of Confined Space:		Entry Supervisor:	
Standby Attendant 1 Name (printed):		Standby Attendant 2 Name (printed):	

Entrant's Name Printed	Entrant's Signature	Enter Time In and Out											
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

CUTTING, WELDING, OPEN FLAME, AND SPARK PRODUCTION PERMIT

NO.: _____

Location: _____ Date: _____

_____ Time: _____

Work to be performed: _____

Permit from _____ _____ to _____ _____

Date Time Date Time

Hazardous Gas/Liquid Area: _____ Dust: _____ Controlled Area: _____

REQUIRED	NOT REQUIRED	N/A	PROTECTION
☐	☐	☐	1. Fire suppression in service.
☐	☐	☐	2. Floors clean of combustibles. 35 feet
☐	☐	☐	3. Combustible floors protected. 35 feet
☐	☐	☐	4. Flammable liquids removed. 35 feet
☐	☐	☐	5. Combustible materials protected. 35 feet
☐	☐	☐	6. All wall or floor openings covered. 35 feet
☐	☐	☐	**MISCELLANEOUS**
☐	☐	☐	7. Inspect for possible conduction of heat to remote combustibles.
☐	☐	☐	8. Flammable liquids and vapors removed from all enclosed equipment.
☐	☐	☐	**FIRE ATTENDANT**
☐	☐	☐	9. Provide a fire watch during and up to 30 minutes (2 hours for coal handling facility) after work. NAME:
☐	☐	☐	10. Provide additional fire suppression equipment (e.g., extinguishers, hose, etc.)
☐	☐	☐	11. Explosive atmosphere test required.
☐	☐	☐	12. Wet down or wash down required.

Special restrictions, precautions, or comments:

The above location has been inspected and the permit issued subject to the precautions noted above.

By: _____
Issuing Authority

Where the work permit shall extend beyond the shift issue, the supervisor assuming responsibility shall sign and date bellow.

1st shift following issue X _____ 4th shift following issue X _____

2nd shift following issue X _____ 5th shift following issue X _____

3rd shift following issue X _____

Work Started: _____ Work Completed: _____ Final Check: _____

The work area and all adjacent areas to which sparks and heat might have spread (such as the floor above and below and the opposite side of the walls) have been inspected and found fire safe.

By: _____

Permit to be posted in work area. After completion of work, return completed form to the plant safety designee.

TVA 6561a [1-2003]

Kingston Ash Recovery Project

DAILY JOB SAFETY ANALYSIS

Use for your daily team review and sign-off. Review the existing Activity Hazard Analysis (AHA), modify as necessary after considering the critical items listed below. If no AHA exists for your task, contact HSE or create one using a blank Job Safety Analysis form.

Date:	Site Name:	Task:

DAILY SITE CONDITION OR ACTIVITY (circle all that apply)		IMPACT ON ACTIVITIES	SAFE PLAN
Weather Conditions	Temp Range: Precipitation: Wind:		
Classification of Work Zone (circle one) EZ CRZ SZ			
Non-routine Chemical Usage			
Excavation Entry			
Energized Electrical Work			
Hot Work (open flame, welding, grinding)			
Work at Heights			
Crane Usage / Critical Lifts			
Confined Space Entry			

Team Lead: _____

Team Members: _____ _____ _____

_____ _____ _____

_____ _____ _____

Kingston Ash Recovery Project

DIRECT READ AIR MONITORING RECORD

Instrument: _____ Monitored By: _____ Date: _____

LOCATION/GRID	WIND	TIME	LEL	O2	CO	PID/FID (SPECIFY)	DUST	DETECTOR TUBE (SPECIFY)

FORM 075

Kingston Ash Recovery Project

EMERGENCY RESPONSE BEST PRACTICE

Date of Event: _____ **Location:** _____

Contractor(s) / Crew(s) Involved: _____

Completed By: _____

Planned Drill? ☐ Yes ☐ No

Changes Required to Emergency Response and Contingency Plan? ☐ Yes ☐ No

Type of Response (check all that apply):

☐ Weather Emergency	☐ Fire	☐ Man Overboard
☐ Medical on Water	☐ Medical on Land	☐ Chemical Release
☐ Motor Vehicle	☐ Underground Utilities	☐ Other _____

Describe Event:

Summarize Response Actions:

Summarize Best Practices Identified:

Kingston Ash Recovery Project

EXCAVATION AND TRENCHING PERMIT

PART A – PERMIT AND EXCAVATION APPROVAL

I. Permit No. KRP - EX - _____ **Task Order No.** _____

II. Location and Description: _____

_____

_____

_____

_____

III. Permit and Excavation Approval:

	Print	Signature	Date
Responsible Supervisor			
Competent Person			
Engineer (Jacobs)			
Engineer (Civil Projects)			
Professional Engineer (if required)			
Program Administrator-Environ.			
Construction Manager (Jacobs)			
Manager (Civil Projects)			
HSE (Jacobs)			

PART B - PERMIT AND EXCAVATION FINAL CLOSURE

I. All Excavation Activities Completed:

	Print	Signature	Date
Responsible Supervisor			
Competent Person			
Engineer (Jacobs)			
Engineer (Civil Projects)			
Construction Manager (Jacobs)			

II. Excavation Documentation Received and Archived:

Document Control			

Return Excavation Permit to Document Control when work is completed

Excavation Start Date:		**Depth of Excavation:**	
Requesting Organization:			
Permit Issued Date:		**Does TVA Procedure 613 or 614 apply?** ☐ **Yes** ☐ **No** **Clearance #**_____	
Method of Excavation: ☐ Hand ☐ Power	**Drawing References (Civil, Mechanical, Electrical):**		

Identify how all underground obstructions were located and approximate depth restrictions:

☐ TN-1-Call (800-351-1111) Ticket Tracking # _____

☐ In House _____

To Be Completed by Competent Person

Soil Classification

Maximum allowable slopes for excavations less than 20 feet (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil Type	Height/depth ratio	Slope angle
☐ Stable Rock	Vertical	90 degrees
☐ Type A	¾:1	53 degrees
☐ Type B	1:1	45 degrees
☐ Type C	1½ :1	34 degrees
☐ Type A (short-term)	½ :1	63 degrees
(For a maximum excavation depth of 12 feet)		

Evaluation by Competent Person

Evaluation Question			
1.	Has the excavation area been checked for embedded pipes and other utilities and their locations identified and marked?	☐ Yes	☐ NA
2.	Are pipes/utilities (including overhead power lines which could be contacted by excavation equipment) required to be de-energized/blanked off and necessary hold orders established?	☐ Yes	☐ No
3.	Do employees need to be briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE)?	☐ Yes	☐ No
4.	Do any surface encumbrances need to be removed or supported?	☐ Yes	☐ No
5.	Are adequate precautions being taken to control water accumulation?	☐ Yes	☐ NA
6.	Are standard guardrails required because employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation?	☐ Yes	☐ NA
7.	Have all employees who are responsible for supervising or entering excavation and trenches completed the training course “Excavations and Trenching - Affected Person?”	☐ Yes	☐ NA
8.	Will walkways or bridges be required for foot traffic?	☐ Yes	☐ No
9.	Are employees protected from loads or objects falling from lifting or digging equipment?	☐ Yes	☐ NA
10.	Is a flagman required wearing warning vests or other suitable garments marked with or made of reflectorized or high visibility materials?	☐ Yes	☐ NA
A Registered Professional Engineer (RPE) shall design/approve shoring or stability of the structure in question if ANY of the questions 11-14 are YES. Is an RPE required?		☐ Yes	☐ No
11.	Will the excavation exceed 20 feet in depth?	☐ Yes	☐ No
12.	Do sloping protective measures meeting 29CFR 1926, Subpart P, “Excavations” require RPE?	☐ Yes	☐ No
13.	Is the excavation adjacent to or beneath any structure or foundation such that the stability of the structure could be affected?	☐ Yes	☐ No
14.	Will vehicles cross the excavation?	☐ Yes	☐ No
If excavation is 4 feet or less, THEN questions 16-23 may be skipped 15.	Is excavation 4 feet or less?	☐ Yes	☐ No

Evaluation Question		
16.	Does the shoring/shielding or sloping system used meet requirements?	☐ Yes ☐ NA
17.	Does the excavation require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres?	☐ Yes ☐ NA
18.	Have adequate warnings, barricades, or stop-logs been provided where mobile equipment is operated adjacent to the excavations?	☐ Yes ☐ NA
19.	Are trenches provided with a fixed means of egress?	☐ Yes ☐ No
20.	Is spacing between ladders or other means of egress such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress?	☐ Yes ☐ NA
21.	Are ladders secured and extend a minimum of 36 inches above the landing?	☐ Yes ☐ NA
22.	Have adequate barricades and warning signs been provided in proximity to pedestrians or vehicle traffic?	☐ Yes ☐ No
23.	Will excavated material and equipment positioned at least 2 feet from the edge of the excavation and/or otherwise restrained from falling into the excavation?	☐ Yes ☐ NA

Daily Excavation Inspection Log

Permit Number: _____

Location: _____

Date	Time	Condition	Competent Person

TVA Excavation Permit

Date:	Permit Number	Responsible Supervisor:	Excavation Start Date:
Requesting Organization:	Reason for Excavation:		
Competent Person:	Location of Excavation:	Depth of Excavation:	
Closure Completed By:	Closure Date:	Permit Issued By:	
Registered Professional Engineer:	Drawing Reference (Civil, Mechanical, Electrical)	Hold Order Number	
Method of Excavation: ☐ Hand ☐ Power			

Sketch Area

Identify all underground obstructions and approximate depth

Restrictions: _____

_____

_____

_____

_____

_____

_____

_____

Soil Classification

Maximum allowable slopes for excavations less than 20 feet (6.09m) based on soil type and angle to the horizontal are as follows:

Soil Type	Height/depth Ratio	Slope Angle
☐ Stable Rock	Vertical	90 degrees
☐ Type A	¾:1	53 degrees
☐ Type B	1:1	45 degrees
☐ Type C	1 ½:1	34 degrees
☐ Type A (short-term)	½:1	63 degrees

(For maximum excavation depth of 12 feet)

Evaluation by Competent Person

	Yes	No
Does the shoring/shielding or sloping system used meet requirements?	☐	☐
Do any surface encumbrances need to be removed or supported?	☐	☐
Does the excavation and/or the protective systems require approval or design by a registered professional engineer?	☐	☐
Does the excavation require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres?	☐	☐
Is the excavation adjacent to or beneath any structure or foundation such that the stability of the structure could be affected? If so, a registered professional engineer shall design/approve shoring or stability of the structure in question?	☐	☐
Has the excavation areas been checked for embedded pipes and other utilities and their locations identified and marked?	☐	☐
Has pipes/utilities (including overhead power lines which could be contacted by excavation equipment) been de-energized/blanked off and necessary hold orders established?	☐	☐
Have employees been briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE)?	☐	☐
Have adequate warnings, barricades or stop-logs been provided where mobile equipment is operated adjacent to the excavations?	☐	☐
Have adequate barricades and warning signs been provided in proximity to pedestrians or vehicle traffic?	☐	☐
Are standard guardrails required because employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation?	☐	☐
Are adequate precautions being taken to control water accumulation?	☐	☐
Have all employees who are responsible for supervising or entering excavation and trenches completed the training course “Excavations and Trenching - Affected Person?”	☐	☐

Evaluation by Competent Person (Continued)

	Yes	No
Will vehicles cross the excavation?	☐	☐
Will walkways or bridges be required for foot traffic?	☐	☐
Are employees protected from loads or objects falling from lifting or digging equipment?	☐	☐
Are trenches more than four feet in depth provided with a fixed means of egress?	☐	☐
Is spacing between ladders or other means of egress such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress?	☐	☐
Are ladders secured and extend a minimum of 36 inches (0.9m) above the landing?	☐	☐
Is a flagman required wearing warning vests or other suitable garments marked with or made of reflectorized or high-visibility materials?	☐	☐

Excavation Inspection Log
Permit Number: _____
Location: _____

Time	Date	Conditions	Foreman/Supervisor

Kingston Ash Recovery Project

FLOAT PLAN

Kingston Ash Recovery Project site contractors are to complete this plan before going boating. Upon completing this float plan, leave the form with the land Point of Contact (POC) while you're on the water. **The POC is to notify TVA Police (800-824-3861) if you do not return by the "Planned Return Time" time and you cannot immediately be located.** Upon return, take the plan back from the POC and submit it to the Contractor Safety & Health Officer for filing.

THIS PLAN DOES NOT HAVE TO BE FILED WITH THE COAST GUARD

Pilot's Name_____Phone #_____

Address: _____

DESCRIPTION OF VESSEL

Name of Vessel_____Registration # _____

Type _____ Hull Color_____ Trim Color _____

Make:_____Hull Material _____

Distinguishing Features _____

Engine(s) Number/Type/Horsepower _____

Fuel Type/Capacity _____☐ Watercraft Checked-in proper working order

TRAILER INFO

Tow Vehicle Registration # _____State _____ Make/Model/Color _____

Trailer Registration # _____ State_____

Ramp Location_____

PASSENGERS ON-BOARD

Name	Phone #
_____	_____
_____	_____
_____	_____
_____	_____

TRIP DETAILS

Departure Date _____Departure Time _____AM / PM

Point of Departure _____

Destination(s)/Purpose of Trip _____

Point of Return _____

Planned Return Date _____Planned Return Time _____AM / PM

SAFETY EQUIPMENT ON-BOARD

☐ Personal Flotation Devices ☐ Flares ☐ Flag and Flashlight ☐ Dock and Anchor Lines ☐ Anchor

☐ Paddle ☐ VHF Radio (Monitor Channel 10 and Weather Alert Channel)

Kingston Ash Recovery Project

INSTRUMENT CALIBRATION LOG

Instrument: _____ Serial Number: _____ Month: _____

DATE	TIME	CAL SOURCE	LOT NUMBER	CONCENTRATION	SPAN SETTING	INITIALS	CAL CHECK	TIME	INITIALS

Kingston Ash Recovery Project

INTEGRATED AIR MONITORING RECORD

Employee Name: _____ Cell Number: _____

Title: _____ Shift Duration: _____ hours

Project Name: _____ Project Number: _____

Sampled By: _____ Sample Date: _____

Sampling Method and Analyte: _____

Justification for Sampling: _____

Sample Type:

☐ Personal-TWA ☐ Area ☐ Bulk Does Sampling Represent Typical Exposure? ☐ Yes ☐ No

☐ Personal Peak ☐ Source ☐ Other _____

Temperature: _____ºF Humidity: _____% Wind: _____MPH Barometer Pressure: _____mb

Collection Media:

☐ Charcoal Tube ☐ Filter (Total) ☐ Passive Dosimeter

☐ Silica Gel ☐ Filter (Resp.) ☐ Other _____

☐ Chromosorb ☐ Impinger

Sample Pump

Mfg. and Model No: _____ Serial No: _____

Calibrator

Mfg. and Model No: _____ Type: _____ Serial #: _____

Calibration Date: _____ Calibrated By: _____

Sample #	Time On	Time Off	Total Time (mins)	Pre-Cal Flow Rate (LPM)	Post-Cal Flow Rate (LPM)	Average Flow Rate (LPM)	Sample Volume (Liters)	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences, etc.)

Signature: _____ Date: _____

Job Safety Analysis

Number:	**Job:**		**Date:**
Page 1 **of** 1	**Supervisor:**	**Plant / Facility:**	**Approved by:**
Skills Required:		**Approved By:**	**Approved By:**
Required Personal Protective Equipment:			
Tools and Equipment Required:			
Job Preparation:			
Hazardous Materials:		**Special Requirements:**	

Number	ACTYIVITY	HAZARD	HAZARD CONTROLS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

FORM 060

Job Safety Analysis (JSA) Surveillance

Date: _____ Location: _____

Initiator: _____

Supervisor: _____

Job Description: _____

JSA TASK (check all that apply)

- ☐ Pre-Construction Walkdown _____
- ☐ Project Hazard Analysis Walkdown _____
- ☐ Project Assessment/Audit _____
- ☐ Project-Specific Task (define) _____

JSA PRE-TASK CONSIDERATIONS

- ☐ Physical/Access Limitations _____
- ☐ Asset Care Rep. Notified _____
- ☐ Fatigue/Stress _____
- ☐ Fit for Task _____
- ☐ Time Restrictions _____
- ☐ Trained for Task Hazard/Controls _____
- ☐ Other (list additional considerations) _____

TRAVEL TO LOCATION

(check all that apply and list action to eliminate or control)

- ☐ Travel Route _____
- ☐ Weather Conditions _____
- ☐ Vehicle Check/Familiarity _____

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Hard hat
- ☐ Safety glasses with side shields
- ☐ Safety toe footwear
- ☐ Hearing protection
- ☐ High visibility vest
- ☐ Gloves, Type: _____
- ☐ Other (list project/task required PPE) _____

TASK HAZARDS

(check all that apply and list action to eliminate or control)

- ☐ Confined Spaces _____
- ☐ Trench/Excavation* _____
- ☐ Material Handling _____
- ☐ Hot Work Activities _____
- ☐ Energized Work Activities* _____
- ☐ Biological (vegetation, animals, etc.) _____
- ☐ Temperature Extremes _____
- ☐ Noise _____
- ☐ Chemical Exposure _____
- ☐ Ergonomics _____
- ☐ Elevated Work* (ladders, scaffolding, >6 ft) _____
- ☐ Overhead Work _____
- ☐ Weather _____
- ☐ Natural/Site Conditions _____
- ☐ Slips, Trips, Falls _____
- ☐ Heavy Equipment (cranes, forklifts, vehicles) _____
- ☐ Lockout/Tagout/Tryout* _____
- ☐ Small Tool Use _____
- ☐ Pinch Points _____
- ☐ Rotating Equipment _____
- ☐ Adjacent Work/Processes _____

*Training required

EMERGENCY INFORMATION

Emergency Evacuation Assembly Point _____

Safety Eyewash & Shower Location _____

Fire Pull Station _____

Security Number _____

Operations Contact/Number _____

Kingston Ash Recovery Project

LIFT PLAN

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS			
Lift Description:			
A. Weight of Load (Equipment) – Live Load			
1. Load/Equipment Condition ☐ New ☐ Used			
2. Weight of Load/Equipment Empty			Lbs.
3. Weight of Attachments			Lbs.
a. Platforms and Ladders			Lbs.
b. Piping and Accessories			Lbs.
c. Liquids Inside			Lbs.
d. Dirt and Debris			Lbs.
e. Internal Trays or Liners			Lbs.
f. Other			Lbs.
4. Total Amount of Load/Equipment Weight (A2 thru A3f)			Lbs.

B. Total Lifted Weight (Load and/or equipment + rigging + main crane deductions)					
1. Load and/or equipment weight plus contingency*		%	7. Wt. Jib Erected		Lb
2. Amount of Equipment Weight		Lb	7a. Wt. of Jib Stowed		Lb
3. Weight of Headache Ball		Lb	8. Wt. of Jib Headache Ball		Lb
4. Weight of Main Block		Lb	9. Wt. of Cable (Load Fall)		Lb
5. Weight of Spreader Bar		Lb	10. Auxiliary Boom Head		Lb
6. Weight of Slings and Shackles		Lb	11. Other:		Lb
*Use 100% plus some percentage (example +10%) to multiply times number in A4 to allow for contingency to compute B2.					
TOTAL LIFTED WEIGHT (Sum B2 thru B11)		Lbs.			
Source of Load Weight (A2) (Name Plate, Drawings, Calculated, Weighed, etc.):					
Weights and Calculations By:			Date:		
Weights and Calculations Verified By:			Date:		

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS				
C. Capacities of the (Main) Crane				
1. Make and Model of Crane:				
2. Counter Weight Size:		Type of Boom:		
3. Lifting Arrangement				
a. Max. Radius During Lift			Ft.	
b. Length of Boom			Ft.	
c. Angle of Boom at Pick			Deg.	
d. Angle of Boom at Set			Deg.	
e. Rated Capacity Under Most Severe Conditions				
1) Over Rear			Lbs.	
2) Over Front			Lbs.	
3) Over Side			Lbs.	
f. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or….)				Lbs.
4. Jib				
a. Is the Jib to be used? ☐ Yes ☐ No				
b. Length of Jib			Ft.	
c. Jib Angle			Deg.	
d. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or…)				Lbs.
5. Load Line/Fall Cable				
a. Is Main Block to be used? ☐ Yes ☐ No				
b. Number of Parts of Cable			#	
c. Size of Cable			Ø Inches	
d. Maximum Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or ….)				Lbs.
D. Percent of Cranes Capacity (>85% requires High Hazard Lift Approvals)				
Total Lifted Weight X 100 ÷ Rated Capacity =				%
E. Size of Slings				
1. Sling Selection				
a. Type of Arrangement			(Spreader, Vertical Slings, etc.)	
b. Number of Slings to Hook		Ø Capacity		Lbs.
c. Sling Size			Ø	
d. Sling Length			Ft.	
e. Sling Capacity (At angle used)			Lbs.	
f. Number of Slings to Load			#	
g. Total Rigging capacity (e X f)				Lbs.
Comments:				
Sketch of rigging arrangement available? ☐ Yes ☐ No If Yes, see Page ( )				
End of Standard Lift Plan Paperwork				

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS		
F. Total Lifted Weight to be lifted by Tailing Crane		
1. Percent of Total Equipment/Material Weight (Generally 50+% based on CG and movement during up righting)		%
2. Amount of Equipment Weight (A4 x F1)		Lbs.
3. Weight of Headache Ball		Lbs.
4. Weight of Block		Lbs.
5. Weight of Lifting Bar		Lbs.
6. Weight of Slings and Shackles		Lbs.
7. Weight of Jib Erected		Lbs.
8. Weight of Jib Headache Ball		Lbs.
9. Weight of Cable Load (Load Fall)		Lbs.
10. Auxiliary Boom Head		Lbs.
11. Other		
12. Total Weight of Load/Equipment lifted by tailing crane (F2 through F11)		Lbs.
Source of Load Weight (Name Plate, Drawings, Calculated, Weighed):		

Weights Verified By:		
	(Printed Name)	(Signature)

G. Capacities for Tailing Crane Based on Configuration		
1. Make and Model of Crane:		
2. Counter Weight Size: Type of Boom:		
3. Lifting Arrangement		
a. Max. Radius During Lift		Ft.
b. Length of Boom		Ft.
c. Angle of Boom at Pick		Deg.
d. Angle of Boom at Set		Deg.
e. Rated Capacity Under Most Severe Conditions		
1) Over Rear		Lbs.
2) Over Front		Lbs.
3) Over Side		Lbs.
f. f. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or…)		Lbs.
4. Jib		
Is the Jib to be used? ☐ Yes ☐ No		
a. Length of Jib		Ft.
b. Jib Angle		Ft.
c. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over, front, side, or…)		Lbs.
5. Cable		
a. Number of Parts		
b. Size of Cable		Inch
c. Maximum Capacity		Lbs.

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS				
H. Percent of Cranes Capacity Tailing Crane				
Total Lifted Weight X 100 ÷ Rated Capacity =				%
I. Size of Slings for Tailing Crane				
1. Sling Selection				
a. Type of Arrangement:				
b. Number of Slings to Hook		Ø Capacity		Lbs.
c. Sling Size				Ø
d. Sling Length				Ft.
e. Sling Capacity (at angle used)				Lbs.
f. Number of Slings to Load				#
g. Total Rigging Capacity (e X f)				Lbs.
J. Soil Bearing Analysis				
1. Soil bearing capacity main crane				
2. Required ground bearing pressure main crane				
3. Soil bearing capacity tailing crane				
4. Required bearing capacity tailing crane				
K. Note Any Rotation of Load at Final Set Location				
Comments:				
Sketch of rigging arrangement available? ☐ Yes ☐ No If Yes, see Page ( )				
L. Reviewed by (additional reviews required for high hazard lifts, see Figure 2):				
Contractor Construction Manager:				
Lift Supervisor:				
Rigging Supervisor :				
Crane Operator:				
Jacobs Construction Manager:				

FIGURE 2: HIGH HAZARD LIFT PERMIT		
A. Lift Identification		
Job Number:	Location:	
Lift Supervisor Name:		
Date of Lift:		Time:
Lift Description:		
B. Approvals (Signatures Required)		
Site Construction Manager:		
	(Signature)	(Date)
Project Manager:		
	(Signature)	(Date)
Lift Supervisor:		
	(Signature)	(Date)
Rigging Superintendent:		
	(Signature)	(Date)
Crane Coordinator:		
	(Signature)	(Date)
Operator(s):		
	(Signature)	(Date)
Engineering:		
	(Signature)	(Date)
If Engineering Designs are Used		
Other:		
	(Signature)	(Date)

C. Attachments (Insert Page Numbers)	Page Number(s)
1. Operator Certifications	
2. Capacity Certificates and Inspection Reports for all Lifting Equipment	
3. Inspection Reports for all Rigging Equipment	
4. Insurance Certificates	
5. Applicable capacity charts and chart notes for lifting equipment	
6. Load and Capacity Calculations	
7. Rigging Diagram(s)	
8. Lift Geometry and Free Body Diagram(s)	
9. Other	
10. Other	

FIGURE 3: PRE-LIFT CHECKLIST		
1. Crane operator meets company qualification requirements?	☐ Yes ☐ No	
2. Lift calculations and rigging plan completed?	☐ Yes ☐ No	
3. Are lift equipment swing & travel requirements & clearances known?	☐ Yes ☐ No	
4. Are all required approvals/permits signed?	☐ Yes ☐ No	
5. Crane inspections up to date (Annual/Monthly/Daily)?	☐ Yes ☐ No	
6. Weather conditions and wind speed acceptable?	☐ Yes ☐ No	
7. Has the stability of the ground been assured by soil bearing analysis?	☐ Yes ☐ No	
8. Location and size of underground facilities are known?	☐ Yes ☐ No	
9. Matting and/or outrigger pads inspected and approved?	☐ Yes ☐ No	
10. Electrical equipment and power lines at required distance?	☐ Yes ☐ No	
11. Rigging Inspected for defects?	☐ Yes ☐ No	
12. Engineered lifting lugs fabricated and installed correctly?	☐ Yes ☐ No	
13. Connecting/disconnecting means been developed?	☐ Yes ☐ No	
14. Have the safety precautions been reviewed?	☐ Yes ☐ No	
15. Is survey equipment required?	☐ Yes ☐ No	
16. Lift Hold Point of ≥_____lbs communicated to crew?	☐ Yes ☐ No	
17. Signal person(s) assigned?	☐ Yes ☐ No	
18. Safe Plan of Action (SPA) Completed?	☐ Yes ☐ No	
19. Pre-Lift Meeting/Task Safety Awareness Meeting (TSA) held?	☐ Yes ☐ No	
20. Hoist area & load path cleared of non-essential personnel?	☐ Yes ☐ No	
21. Crane set up per the lift plan (radius, configuration, etc)?	☐ Yes ☐ No	
22. Rigging equipment and tag line(s) installed per plan?	☐ Yes ☐ No	
Completed By:		
(Printed Name)	(Signature)	(Date)

Kingston Ash Recovery Project

PPE DOWNGRADE RATIONALE

Exposure Group/Crew: _____ Date: _____

ITEM	CURRENT	PROPOSED
Suit		
Respirator		
Cartridge		
Cartridge Change-out Frequency		
Gloves	1.	1.
	2.	2.
	3.	3.
Boots		
Other		

Rationale for Change:

Condition Causing Suspension of Downgrade:

Approvals:

Crew Superintendent: _____

Site Manager: _____

Program Health and Safety Manager: _____

Kingston Ash Recovery Project

SAFETY COACHING VISIT CHECKLIST

Location:	Date and Time of Observation:
Type of work being observed:	Number of people observed:
Equipment being worked on:	Name of SCV Coach:
Pre-job briefing held? ☐ Yes ☐ No	
Two minute rule used? ☐ Yes ☐ No	Eyes on Path Used? ☐ Yes ☐ No

CATEGORY A			**CATEGORY C**			**CATEGORY E**		
Adequacy of PPE			**Are Reactions of People Appropriate**			**Procedures**		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Eyes and face	☐	☐	Adjusting PPE	☐	☐	Standard practice adequate	☐	☐
Ears	☐	☐	Changing positions	☐	☐	Standard practice established	☐	☐
Head	☐	☐	Rearranging jobs	☐	☐	Standard practice maintained	☐	☐
Hands and arms	☐	☐	Stopping job	☐	☐	Electrical clearance proper	☐	☐
Feet and legs	☐	☐	Attaching grounds	☐	☐	Fire watch adequate	☐	☐
Respiratory system	☐	☐	Exposure to moving equipment	☐	☐	Crew properly briefed	☐	☐
Trunk	☐	☐	Changing tools	☐	☐	Clearance boundaries	☐	☐
Arc slash	☐	☐	Hurrying	☐	☐			

CATEGORY B			**CATEGORY D**			**CATEGORY F**		
Positions of People			**Tools & Equipment**			**Orderliness**		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Struck By	☐	☐	Right for job	☐	☐	Standards established	☐	☐
Off balance	☐	☐	Used correctly	☐	☐	Standards understood	☐	☐
Caught between	☐	☐	Carried or stored properly	☐	☐	Passageways clear	☐	☐
Falling	☐	☐	Serviceable	☐	☐	Tools &materials organized	☐	☐
Riding on equipment	☐	☐	Seat belt in use	☐	☐	Stairs unobstructed	☐	☐
Electrical contact	☐	☐	Barricades or warning lights	☐	☐	Housekeeping appearance adequate	☐	☐
Chemical exposure	☐	☐	Checks restraints used	☐	☐	FME standards maintained	☐	☐
Overexertion	☐	☐	Inspection color code present	☐	☐	Walking surfaces clear	☐	☐
Repetitive motion	☐	☐	Mobile equipment	☐	☐			

SUMMARY OF OBSERVATIONS

Category A

Category B

Category C

Category D

Category E

Category F

General Recommendations

Kingston Ash Recovery Project

SAFETY OBSERVATION REPORT

SOR No.:	Date:	Time:	Location:	Contractor:

Observation:

Describe Immediate Corrective Action:

Describe Action to Prevent Recurrence:

Observer:

Printed Name _____ Signature _____

Category:

- ☐ Biological
- ☐ Electrical
- ☐ Ergonomics
- ☐ Facilities
- ☐ Fall From Elevation
- ☐ Good Work Practices
- ☐ Housekeeping
- ☐ PPE
- ☐ Slips, Trips, & Falls
- ☐ Spills/Releases
- ☐ Tools & Equipment
- ☐ Vehicle
- ☐ Weather
- ☐ Work Practice
- ☐ Other

Description of Corrective Action:

Supervisor/Manager:

Printed Name _____ Signature _____ Date Completed _____

Copy:

Jacobs Project Manager _____ Contractor SSHO _____ Other _____

FORM 061

☐ Closed?

Safety Observation Report (SOR)

Date: _____ Time: _____ AM / PM

Name: _____

Company: _____

Supervisor: _____

Location:

☐ Site Road
☐ Public Road
☐ Office Trailer
☐ Sampling House
☐ Berkshire House
☐ Rim Ditch / Sluice Trench
☐ Ponds
☐ River
☐ Skimmer Wall / Weir 1
☐ Dredge Cell
☐ Central Embayment
☐ North Embayment
☐ East Embayment
☐ Dikes
☐ Ball Field
☐ Rail
☐ Loading Area
☐ Other (list): _____

Observation:

☐ Unsafe Act ☐ Safe Act ☐ Unsafe Condition ☐ Safe Condition

Description (continue on back if needed): _____

_____

Action taken or to prevent recurrence: _____

_____

☐ Housekeeping
☐ Fall Protection
☐ Scaffolds, Ladders, Stairways
☐ Slips, Trips, Falls
☐ Personal Protective Equipment
☐ Vehicles, Mobile Equipment
☐ Heavy Equipment
☐ Tools and Equipment
☐ Material Handling
☐ Utilities
☐ Weather
☐ Work Practices
☐ Electrical
☐ Ergonomics, Repetitive Stress
☐ Biological
☐ Other

SOR Tips

Housekeeping: Trash, tripping hazards, cords, material storage, access, egress

Fall Protection: Railings, tie-offs, anchorage, PPE, inspection

Scaffolds, Ladders, Stairways: Inspect, tag, position, tie-off

Personal Protective Equipment: Head, face, hands, hearing, feet, clothing

Slips, Trips, Falls: Walkways, illumination, alertness

Vehicles, Mobile Equipment: Inspection, operation, maintenance

Heavy Equipment: Backup alarms, spotters, training

Tools and Equipment: Selection, use and maintenance

Material Handling: Hoisting, rigging, proper use, inspection

Utilities: Electrical hazards, potable water

Weather: Lightning, heat, cold, rain, tornado

Work Practices: Body position, cheaters, pinch points, proper tools

Electrical: Verify energy control steps, GFCI, cords, LO/TO

Ergonomics/Repetitive Stress: Configuration, layout

Confined Space: Permit, testing, attendant training, retrieval equipment

Biological: Poisonous plants, spiders, insects, snakes, rodents

Other: Positive, safe act / condition / behavior

_____

_____

_____

_____

_____

_____

Kingston Ash Recovery Project

SITE TAILGATE MEETING

Conducted By: _____ Date: _____ Time: _____

Location: _____

Type of Work: _____

HEALTH AND SAFETY TOPICS PRESENTED

PPE/Equipment:

_____

Chemical Hazards: _____

_____

Physical Hazards: _____

Emergency Procedures:

_____

Emergency Response

Hospital/Clinic: _____

Address: _____

Special Equipment: _____

Evacuation Route: _____

_____

General Discussion Information:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ATTENDEES

Date: _____

Printed Name	Company	Signature

Task Managed Contractor Preliminary Incident / Injury Report

Instructions: This report must be completed by the contractor manager for all OSHA recordable incidents that occur. This applies to all task managed **Contractors and Subcontractors**. The completed form must be e-mailed within 24 hours of occurrence to the **Technical Contract Manager (TCM)** and the TVA distribution list below:

Job Title of Person(s) Injured:

Company Name:

Site Management Contact:

Description of Possible Injuries:

Date and Time of Injury(s):

Work Location:

Did the injured employee return to work? ☐ **Yes** ☐ **No**

Description of Event(s) That Caused Injuries
(What happened and why based on initial factual information?)

Immediate Corrective Actions Taken/Steps Take to Mitigate Future Exposure:

Distribution of this report via e-mail within 24 hours of occurrence:

Ashok S. Bhatnagar	Ralph E. Dudley	Rob E. Manning	Anda Ray
Tabitha A. Billingsley	Janet C. Herrin	William R. McCollum	Phillip L. Reynolds
Tiffany T. Bridges	Tom Kilgore	John McCormick	Preston D. Swafford
Terrell Burkhart	John E. Long, Jr.	Jeffrey T. Parsley	Dana J. White
TVTLC Hourly LaGonda Wittenmyer (lmatoy@aol.com)	TVTLC Annual Jan Jennings (jan@branstetterlaw.com)		

Kingston Ash Recovery Project
VISITOR ORIENTATION

Date: _____

Visitor Name: _____ Company: _____

Escort Name: _____ Company: _____

Purpose of Visit: _____

_____

Topics Discussed:

1. Escort required at all times.
2. Emergency response numbers.
3. Ammonia awareness.
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Signatures:

_____ _____

Visitor Escort

_____

HSE Representative

Kingston Ash Recovery Project

WET BULB GLOBE THERMOMETER (WBGT) READINGS

Instrument: Metrosonics hs-32 Serial Number: MCI100023 Cal Due Date: _____

Monitored By: _____ Date: _____

LOCATION/GRID	NOTIFICATION (1st, 2nd, 3rd, etc.)	TIME	WBGTO	GLOBE	WET	DRY

Kingston Ash Recovery Project
HAZARD LEVEL-BASED ES&H CORRECTIVE ACTIONS TRACKING REPORT

	OBSERVATIONS						HAZARD			IF KNOWN AND/OR APPROPRIATE		APPROPRIATE CORRECTION ACTION		CLOSED	
#	Date	Organization	Location	Description	Observed By	New or Follow-Up	Hi Hazard Δ	Lo Hazard •	Other □	Recommendation / Reference	Responsible Party	Yes	No	Yes - Date	No - Follow-Up Date
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

Notes:

1. High Hazard - Situation presenting exposure to a potentially high level of danger - e.g., potential source of imminent/immediate danger or IDLH (resultant high severity source of unmitigated ES&H or property/operational loss).
2. Low Hazard - Situation presenting exposure to a potentially low level of danger - e.g., potential source of routine/average safety problems (resultant low severity source of unmitigated ES&H or property/operational loss).
3. Other Hazard - Any other situation that, in your judgment, presents a potential hazard exposure that warrants at least some attention, correction, referral, review, analysis - e.g., potential ES&H **or** other hazard(s) associated with maintenance, operations, monitoring, planning, management, follow-up, etc.

Kingston Ash Recovery Project

WORK ZONE CLASSIFICATION CHANGE NOTICE

Change Date: _____ Change Duration: _____

Area(s) Impacted: _____

_____

Description of Change (Attach Drawing): _____

_____

Justification: _____

_____

Submitted By: _____

Change Type

- ☐ 1. Exclusion Zone to Contamination Reduction Zone
- ☐ 2. Exclusion Zone to Support Zone
- ☐ 3. Contamination Reduction Zone to Exclusion Zone
- ☐ 4. Contamination Reduction Zone to Support Zone
- ☐ 5. Support Zone to Exclusion Zone
- ☐ 6. Support Zone to Contamination Reduction Zone
- ☐ Other: _____

Adjustments to Decontamination Areas or Entry Control Points

- ☐ Are Not Needed
- ☐ Are Needed (describe below)

Indicate how impacted personnel will be notified:

Approvals:

Construction Manager: _____

Program Health and Safety Manager: _____

Program Manager (for change types 5 and 6 only): _____

APPENDIX E
ACTIVITY HAZARD ANALYSIS

Debris Removal
Equipment Maintenance and Repair
Hydraulic Repair Below Deck
Mule Operation
Pipeline Management
Process Oversight and Management
Railcar Loading
Rim Ditch Management
Sampling from Boats
Shoreline Dredge Support
Trailer Operations
Vibecore Sampling on Water

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Debris Removal**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Placement of excavator or crane on barge; securing onto barge	Falling overboard	– All persons remain seated except when working – All personnel to wear USCG-approved PFDs – Nonslip surfaces on all working surfaces – Adequate number of throw rings on each watercraft per EM385 – USCG approved – Complete Float Plan, shore support, and communication	– PPE – Documented crane inspection – TVA TSP 306 – TVA TSP 802 – Float Plan
	Crane failure	– Complete Critical Lift Plan before lift occurs – Follow Jacobs guidelines for lift capacity	– Completed Lift Plan
	Water craft operation	– Watercraft to be inspected by USCG or Registered Marine Surveyor – PE to evaluate barge for stability for equipment placement – Load rating adhered to – Watercraft to have approved lighting and signaling devices – Pilots to be familiar with rules that regulate boat traffic	– USCG license
Debris removal operations	Caught between/struck by	– Minimize number on dredges – Follow plan for debris removal	– Dredging Plan – TVA TSP 603
	Work over or near water	– All persons to remain seated when not working – Wear USCG-approved PFDs – All means of boat access to be properly secured and guarded – Adequate number of throw rings available – USCG-approved style – Dredges and barges equipped with guardrails – Shore support available and radio contact maintained – All personnel trained in man overboard emergencies – Railings around boat deck	– Float Plan – PPE – PFDs and throw rings – TVA TSP 306 – TVA TSP 603
	Noise	– All exposed workers below 85 dBA to wear hearing protection – Mufflers on engines	– PPE, hearing protection

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Debris Removal**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Debris removal operations (continued)	Heat stress	– Work/rest cycles according to ACGIH tables – Heat and worker monitoring – Shade and drinks available for hydration	– Shade and liquids – ACGIH tables – Wet bulb globe thermometers
	Striking overhead utilities	– Utility check performed beforehand – Crane mast at least 20 feet from overhead line – Set up lift to avoid power lines	– Utility clearance permit
	Striking underground or underwater utilities	– Identify underground utilities – Clearance permit in work area – Cease work if unknown utilities are identified – Keep at least 5 feet away from known utilities or remove manually	– Utility clearance permit
	Watercraft operation	– All watercraft to be inspected by USCG or Registered Marine Surveyor – Load ratings strictly adhered to – USCG approved – All watercraft to have approved lighting and signaling devices – Operation only by those personnel who have successfully completed the required boating course – All dredges and boat pilots to be familiar with rules that regulate boat traffic	– USCG license – TVA TSP 603
	Unauthorized entry into Exclusion Zone	– Include appropriate warning signs designated area as a work zone	– Warning signs
	Barge instability	– Understand weight limits – Tie down equipment when necessary – Personnel to wear PFDs	– Calculation of barge stability – PPE

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Debris Removal**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Debris removal operations (continued)	Struck by/against	– Personnel to be out of swing radius of equipment – Keep good eye contact with operators – Personnel to wear ANSI high visibility vests and USCG-approved PFDs	– PPE – Good line of vision
	Severe weather	– Weather forecasts to be monitored for predicted inclement weather – All personnel to be aware of forecasts – Work to be stopped in event of high winds, rough water, lightning, or thunder identified	– Communication devices – Weather forecasting equipment
	Potential exposure to constituents of fly ash	– Material removed from the river will be wet, but may dry as it sits on the debris barge – This material should be moved while wet, and dust control implemented to minimize the potential exposure to nearby workers – Dust control measures should be implemented when the debris is removed from the barge and transported to stockpiles if it has been allowed to dry out	– Dust control measures

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Dredges, support boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified
Fire extinguishers	– Monthly inspections will be performed	– Contractors to have knowledge of proper use
Heavy equipment	– Inspect before use and document	– Contractors to have knowledge of proper use
PPE=Level D	– Inspect before use	– Contractors to have knowledge of proper use

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge	Slips, trips, and falls	– Work Areas and means of access shall be maintained safe and orderly – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified – Fall protection will be used when working at unprotected heights greater than 6 feet – Standard railings will be installed on all process equipment decks greater than 4 feet	– Fall protection systems – Standard railings – Proper handrails on stairs
	Vehicular traffic / problems	– Spotters will be used when backing up trucks and moving equipment – Heavy equipment will be equipped with backup alarms – When work areas impact vehicle ways, traffic control markings, and/or a flagman will be used	– Working backup alarms
	Weather	– Personnel will be instructed in heat stress/cold stress recognition and prevention – Personnel must notify the SSHO if symptoms of cold/heat stress are perceived in any member of the crew, including self – Work/rest regimes and personnel monitoring for workers will be instituted per the SSHO based on ambient conditions and condition of personnel – Air temperature, humidity, and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary – Drinking liquids will be available and used for rehydration during breaks – Work will be conducted during warmer/cooler hours of the day, if necessary and feasible – Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, or lightning	– Drinking fluids – Shaded break areas – Emergency communication

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge (continued)	Back injuries	– Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate for use – Proper paths of travel will be noted and followed during manual material handling	
	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area – All radios, cell phones, and equipment will be secured – Tools and parts will be lifted or carried, not tossed – Personnel will not climb ladders while carrying equipment in hand	– Steel-toe boots
	Overhead hazards	– All overhead hazards will be identified prior to commencing work operations – Personnel will wear hard hats that meet ANSI Standard Z-89.1	– Hard hats
	Noise	– Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs) – All equipment will be equipped with manufacturer's required mufflers – Proper use of vibratory hammer to minimize noise generation	– Ear plugs / ear muffs
	Eye/face injury	– Safety glasses with side shields meeting ANSI Standard Z-87 will be worn – Face shields will be worn over safety glasses during grinding, wire wheel work, or other activities posing face hazards – Proper guards will be used on all equipment such as grinders, cutoff wheels, and saws	– Safety glasses – Face shields – Equipment guards

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge (continued)	Struck by/against	– Personnel will understand and review hand signals – All personnel will wear ANSI Type II high visibility vests – Workers will be made aware of potential pinch points during operation and maintenance of equipment (bolting flanges, process piping, etc.) and keep hands free from potential pinch points – Proper lockout procedures will be followed when personnel are required to work on mechanical equipment – Equipment will be reduced to a zero energy state prior to workers removing guards, entering, or placing bodies within areas of operation – When necessary, equipment will be blocked, chocked, or supported to prevent movement while workers are in danger areas	– High visibility vests – LO/TO equipment and procedures
	Electrical	– All electrical tools and equipment will be equipped with GFCI – All electrical work will be done by licensed electricians – Electrical equipment will be properly locked out during equipment installation and connection – Each worker involved in lockout will have their own uniquely keyed lock installed on the lockout device – Equipment will not be energized until it has been verified that all connections are properly secured and all personnel have removed their own locks from the lockout device – Tags will not be used in lieu of lockout devices – Electrical cords will not be laid across roads where vehicular traffic may damage the cord – All extension cords will have a three blade grounding plug, all outlets will accommodate a three-prong plug – Portable generators will placed on solid ground prior to starting, generators will not be run from the back of trucks unless properly grounded	– Functioning GFCI – LO/TO as required – Three-prong extension cords – Grounding means when necessary for generators

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge (continued)	Hot work/fire	– All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids; allowable container size will comply with TVA TSP 906 – Fire extinguishers will be installed at all areas designated for flammable and combustible storage – Internal hot work permits will be issued by the SSHO or HSS – A fire watch will remain in the vicinity during hot work and for at least 30 minutes after hot work has been completed – Flammables will remain at least 50 feet away from hot work activities, combustibles at least 35 feet – Fire extinguishers will be inspected at least monthly and re-certified annually – Hot work will not occur in confined spaces without SSHO approval – Proper flammable storage areas will be utilized as necessary and as a minimum comply with TVA TSP 906, Section 3 – Oxyfuel gas welding and cutting equipment shall be configured and maintained per the requirements of TVA TSP 815, Section 8	– Safety can for flammables – Hot work permits – Fire extinguishers – Fire watch
	Spills	– Secondary containment will be utilized for all fuel/chemical storage areas – Appropriate spill kits will be available, consideration will be taken for spills on water – All spills will be reported to the SSHO or appropriate designee – Verification will be made that spill volume does not exceed reportable quantities – Spills will be promptly controlled, contained, and cleaned – Contaminated materials will be properly containerized and labeled while awaiting disposal – Disposal will be in accordance with appropriate local, state, and federal regulations	– Containment and clean-up materials

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge (continued)	Falling overboard and/or stranding	– All persons onboard will remain seated, except when working – All personnel shall wear USCG-approved PFDs per the requirements of TVA TSP 306 – Nonslip surfaces will be provided on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways – All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards – An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of TVA TSP 306, Section 6 – All throw rings will be USCG approved – Maximum weight capacity for watercraft will not be exceeded – Dredges and barges will be equipped with perimeter guardrails – Watercraft will not be used without shore support personnel – Personnel onboard watercraft must be in radio contact with shore personnel – All personnel working on watercraft will be trained in man overboard emergencies; drills will be conducted to verify personnel are aware of their responsibilities	– PFDs – Throw rings – Guardrails
	Water craft operation	– All dredge and boat pilots shall be familiar with the “Rules of the Road” that regulate movement of boat traffic within the river – Water craft will be operated only by those personnel who have successfully completed the required boating safety course – Charts of the study areas, with depths for mean low water, will be obtained and watercraft pilots will be familiar with their use – Locations of rocks, ledges, and manmade surface obstructions will be noted within the study area – these will be given a wide berth. – All river boating regulations will be strictly observed – All watercraft must have required USCG-approved lighting and signaling devices	– Properly inspected and maintained equipment

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, and dredge (continued)	Sinking boat/dredge damage	– All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor – The load ratings of dredges/boats will be strictly adhered to; overloading of vessels is prohibited – In the event the boat becomes grounded at times of low water, no attempt will be made to move the boat until enough water returns to re-float it – Oil absorbent booms will be kept onboard in the event of a spill – No unnecessary fuel cans will be onboard	
	Exposure to chemical constituents of fly ash	– Equipment should be wet cleaned prior to maintenance work – Areas such as radiators, bushings, fittings, etc. must not be blown-out with compressed air – Upon completion of tasks and prior to exiting the Contamination Reduction Zone, wash hands and face thoroughly; remove materials from boots and work clothing	– Power washer as necessary

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Equipment Maintenance and Repair**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Dredges, support boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified
Fire extinguishers	– Monthly inspections will be performed	– Contractors to have knowledge of proper use
Heavy equipment	– Inspect before use and document	– Contractors to have knowledge of proper use
PPE=Level D	– Inspect before use	– Contractors to have knowledge of proper use
Hand tools	– Before use	– Per manufacturer recommendations
GFCI	– Before use	– Not applicable

ACTIVITY HAZARD ANALYSIS

SITE: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Hydraulic Dredging**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Dredge launching and setup using crane	Struck by/against	– Demarcate and stay clear of swing radius – Only licensed qualified operators, certification required by TVA – Crane inspection – annual, daily – Use tag lines – Work crews wear ANSI high visibility vests	– PPE – Documented crane inspection – TVA TSP 802
	Crane failure	– Complete Lift Plan before lift occurs – Follow guidelines for lift capacity	– Completed Lift Plan
	Striking overhead utilities	– Crane mast at least 20 feet from overhead line – Set up lift to avoid power lines	
Dredging operations	Caught between/struck by	– Minimize number on dredges – Follow plan for dredging	– Dredging Plan – TVA TSP 603
	Work over or near water	– All persons to remain seated when not working – Wear USCG-approved PFDs – All means of boat access to be properly secured and guarded – Adequate number of throw rings available – USCG-approved style – Dredges and barges equipped with guardrails – Shore support available and radio contact maintained – All personnel trained in man overboard emergencies – Railings around boat deck	– Float Plan – PPE – PFDs and throw rings – TVA TSP 306 – TVA TSP 603
	Noise	– All exposed workers >85 dBA to wear hearing protection – Mufflers on engines	– PPE, hearing protection
	Heat stress	– Work/rest cycles according to ACGIH tables – Heat and worker monitoring – Shade and drinks available for hydration	– Shade and liquids – ACGIH tables – Wet bulb globe thermometers

ACTIVITY HAZARD ANALYSIS

SITE: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Hydraulic Dredging**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Dredging operations (continued)	Watercraft operation	– All watercraft to be inspected by USCG or Registered Marine Surveyor – Load ratings strictly adhered to – USCG approved – All watercraft to have approved lighting and signaling devices – Operation only by those personnel who have successfully completed the required boating course – All dredges and boat pilots to be familiar with rules that regulate boat traffic	– USCG license – TVA TSP 603
	Unauthorized entry into Exclusion Zone	– Include appropriate warning signs designated area as a work zone	– Warning signs
	Severe weather	– Weather forecasts to be monitored for predicted inclement weather – All personnel to be aware of forecasts – Work to be stopped in event of high winds, rough water, lightning, or thunder identified	– Communication devices – Weather forecasting equipment
	Potential exposure to fly ash constituents	– Minimal controls required, this is a closed, wet process – No dust is expected during routine operations – If dredge maintenance activities or other activities are incorporated, additional AHAs will be required	

ACTIVITY HAZARD ANALYSIS

SITE: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Hydraulic Dredging**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Dredges, support boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified
Fire extinguishers	– Monthly inspections will be performed	– Contractors to have knowledge of proper use
Barricades, decon facilities	– Inspect before use	– Contractors to have knowledge of proper use
PPE=Level D	– Inspect before use	– Contractors to have knowledge of proper use

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Hydraulic Repair Below Deck**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Stage equipment on Jon boat and dredge (drums, pump and hydraulic fittings)	Pinch points, heavy lifting, foot hazards	– Use mechanical lifting when possible – Wear proper hand and foot protection – Use an adequate number of people for lift	– Leather gloves – Steel-toe boots
Remove water from below deck with hand pump	Working on water, spilling contaminated water	– Wear PFDs – Have spill containment readily available	– Type V PFD – Spill clean-up equipment
Check atmosphere in confined space	None		– Five-gas meter
Complete CSE permit and set up retrieval equipment	Pinch points	– Watch pinch points on tripod – Wear leather gloves	– Leather gloves
De-energize and bleed pressure by moving controls, LO/TO hydraulics	None, no fittings are removed		
Enter confined space	Tight area, discharge pipe obstructions, electrical from lighting	– Proper lighting – Connection to retrieval system – GFCI for all electrical – Adequate standby person – Supervisor and contact to rescue squad	– Lighting – GFCI protected electrical – Standby and supervisor for confined space entry
Perform inspections and repairs	Use care when removing fittings, prevent potential uncontrolled pressure release	– Trained mechanics to perform work	
Reconnect hydraulics, bleed air from lines	Line failure, connection failure, discharge of fluid, noise	– No one to remain in space during start-up, testing, and bleeding – Collect all fluid during bleed off activities – Wear proper hearing protection	– Spill containment materials – Hearing protection

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Hydraulic Repair Below Deck**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Demobilize equipment	Pinch points, heavy lifting, foot hazards	– Use mechanical lifting when possible – Wear proper hand and foot protection – Use an adequate number of people for lift	– Leather gloves – Steel-toe boots
Remove drums from work boat using Lull	Equipment damage, pinch points, dropping loads	– Keep all non-essential people clear of lift area – Use proper rigging and rigging techniques – Designated competent operators only	– Proper rigging

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
	–	–
	–	–
	–	–
	–	–

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Mule Operation**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Inspect vehicle	Nearby work activity or vehicles	– Be sure there is no hazard from oncoming traffic, heavy equipment, or other activities prior to conducting walk-around of vehicle	– High visibility vest
	Vehicle in disrepair	– If any discrepancies are identified during inspection notify Brian Jacobs – Do not operate equipment	
Vehicle operation onsite	Ejection from vehicle	– All personnel must be in a designated seat and utilize safety belts – No passengers are to ride on the back, ends, sides, etc. – Doors must remain closed during operation	– Seats, safety belts
	Crushing or impact injury	– All passengers must keep head, arms, legs, and feet inside the vehicle while in motion – Doors must remain closed while vehicle is in motion	– Vehicles with doors or leg restraints are required – No open sided vehicles are to be used
	Operating on uneven terrain or high angles	– Only trained operators are to drive Mules – Operation must be within the limitations established in the manufacturer's manuals – Always traverse hills directly up or down at a moderate speed – Do not attempt sudden maneuvers on hills or travel horizontally on hills	– Trained operators – Operator manuals
	Operating around large vehicles, heavy equipment	– Approach this type of equipment assuming operator does not see you – Before entering areas where this equipment is in operation, make eye contact with the operator and acknowledgement that it is safe to proceed – Always yield the right of way to larger vehicles – Operate vehicles with visibility flags installed only	– Vehicle flags – Trained operators

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Mule Operation**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Vehicle operation onsite (continued)	Inadvertent backing or backing into pedestrians	– Operate vehicles with backup alarms only – Pause before moving vehicle to check gear engagement – Use spotters as necessary	– Backup alarms – Spotters
	Interacting with flaggers onsite	– Vehicles do not have directional lights – Signal direction of travel using clear hand signals	
	Unsecured equipment or materials	– Do not place unsecured materials or equipment inside vehicle – Use racks when available; secure equipment and materials in racks with proper tiedown straps – Be sure equipment loaded on vehicle does not extend more than 1 foot from the side or 3 feet from the back of vehicle – Flag materials as needed	– Equipment racks – Tiedown straps – Flagging
	Night operations	– Verify all headlights and taillights are fully functional – Clean reflective strips / surfaces as necessary to keep visible	– Headlights – Taillights – Clean reflective surfaces
Vehicle decontamination	Vehicle decontamination, pressurized water	– In the event vehicle decon is required, stop vehicle at the entry control point, shut engine off, and exit vehicle during decon process	
Parking vehicle		– Attempt to park vehicle so first move for next driver is forward – Place vehicle in park or neutral, engage brake	
		– Do not park vehicle directly behind or in front of heavy equipment as the equipment operator may not be able to see the Mule prior to moving the heavy equipment	

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Mule Operation**

Date of Analysis: 5/12/09

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week of							
Driver							
Passenger							
Week of							
Driver							
Passenger							
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ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Pipeline Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Vehicle loading/unloading	Slippery surfaces on and around vehicle	– Check loading area and vehicle surfaces for water, oil, ice, frost etc., prior to moving equipment	Ice melt, brooms, adsorbent towels for petroleum
	Moving heavy or awkward equipment	– Utilize adequate number of personnel to move equipment, use hand trucks if available – Use trucks with lift gates whenever possible	Lift gates, hand trucks, loading dock if available
	Unsecured equipment	– Properly secure all equipment with rope and anchor points on trucks – Load heaviest equipment farthest forward in vehicle	Rope, anchor points
Travel to/from site	Unfamiliarity with location distracting driver	– Map out travel route and destination prior to departing – Utilize a passenger to act as the navigator	Maps
	Difficult terrain	– Use proper vehicles for accessing work location	4WD vehicles as necessary
	General traffic hazards	– Drive defensively, use seatbelts	Seat belts for all passengers
Site set-up and control	Pedestrians, children, vehicles, etc.	– Properly secure work area using caution tape, barricades and other appropriate hazard markings – In some instances fencing may be necessary – It may be necessary to backfill all excavations daily, particularly if work is being done in an area frequented by children	Hazard markings, barricades, fencing
	Unauthorized entry into work zone	– Include appropriate warning signs designated area as a work zones – Keep unauthorized personnel	Warning signs
	Potential exposure to fly ash constituents	– Work in areas or on surfaces which are free from fly ash whenever possible; if this is not feasible, perform dust control measures in work area and minimize disturbance of materials, generation of dust – Thoroughly wash hands and face, remove materials from boots and clothing as necessary	Dust control measures

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Pipeline Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Fabrication of dual wall and single wall HDPE pipelines using fusion welding system	Maneuvering pipe, awkward positioning	– Proper positioning – Team lifting – Use of fork trucks and equipment to move and position pipe – Wear gloves and steel-toe boots	– Equipment to position pipe and welder – PPE
	Contact of bare skin on heating elements	– Cover exposed skin with protective clothing and gloves – Use First Aid if exposure occurs	– PPE – First Aid kit with burn treatment
	Fire	– The gasoline-powered engine on the welder will only be fueled while off and after cooling down – Follow terms of hot work permit – A 5BC extinguisher will be placed upwind within 25 feet of the operation	– Fire extinguisher – TVA TSP 809
	Road traffic and heavy equipment in vicinity of welding operations	– Perform welding in areas away from roads and travel paths – Setup well-defined work zones – Wear ANSI high visibility vests	– Caution tape or cones marking work areas – PPE
Putting welded pipe into place	Maneuvering pipe, awkward positioning	– Proper positioning – Team lifting – Use of fork trucks and equipment to move/position pipe – Wear gloves and steel-toe boots – Site personnel will be instructed in and use proper lifting techniques – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate – Stretch before lifting	– Equipment to position pipe and welder – PPE – Awareness of other workers – Proper lifting techniques

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Pipeline Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Putting welded pipe into place (continued)	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Secure all radios, cell phones, and equipment – Rigging will be inspected and sized for offloading pipe, valves, etc.	– PPE – Means of securing load
Watercraft being used to assist in placing pipe	Working on and around water, watercraft, and barge movement	– All persons onboard will remain seated, except when working – All personnel shall wear USCG-approved PFDs – Nonslip surfaces on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways – All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards – An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of EM 385-1-1, Section 05.H.03A; all throw rings will be USCG approved – Maximum weight capacity for watercraft will not be exceeded – Watercraft will not be used without shore support personnel – Personnel onboard watercraft must be in radio contact with shore personnel – All personnel working on watercraft will be trained in man overboard emergencies; drills will be conducted to verify personnel are aware of their responsibilities – A safety skiff (backup boat) will be available during on water activities	– PFDs sufficient number and condition – Knowledge of proper boating requirement – Working communication devices – TVA TSP 306 – TVA TSP 603
Watercraft assist with burying pipe underwater	Watercraft operations not consistent with USCG requirements	– All boat pilots shall be familiar with the “Rules of the Road” that regulate movement of boat traffic within the river – Charts of the study areas, with depths for mean low water, will be obtained and watercraft pilots will be familiar with their use – Locations of rocks, ledges, and manmade surface obstructions will be noted within the study area – these will be given a wide berth	– Know boat requirements – Boats in good working condition – TVA TSP 603

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Pipeline Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Watercraft assist with burying pipe underwater (continued)	Watercraft operations not consistent with USCG requirements (continued)	– All harbor boating regulations will be strictly observed – All watercraft must have required USCG-approved lighting and signaling devices – Float Plan submitted for each watercraft operation each day	
Watercraft assist in laying process pipe	Sinking boat	– All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor – The load ratings of barges/boats will be strictly adhered to; overloading of vessels is prohibited – Oil absorbent booms will be kept onboard in the event of a spill – No unnecessary fuel cans will be onboard	– Boats in good condition – Proper PPE for boating – Inspections performed
	Cold/heat stress	– Proper clothing and shade when needed – Work/rest cycles from ACGIH based on monitoring – Maintain dry clothing – Stay hydrated	– Wet bulb globe thermometer – Shade – ACGIH tables
Watercraft assist in laying process pipe (continued)	Severe weather	– National weather forecasts will be monitored daily for predicted inclement weather – All personnel shall be aware of the forecast and keep an “eye to the sky”; storms may also occur without warning – Work will be postponed in the event of strong winds, high seas, or at times of very poor visibility – In the event of lightning in the area, work will cease	– Internet access to weather forecast – Float Plan – Communication devices
Booster pump operation	Noise	– Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs) – All equipment will be equipped with manufacturer’s required mufflers	– PPE

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Pipeline Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Booster pump operation (continued)	Fuel spill	– Secondary containment will be utilized for all fuel/chemical storage areas – Appropriate spill kits will be available, equipment will be suitable for use on water – All spills will be reported to the SSHO or appropriate designee – Verification will be made that spill volume does not exceed reportable quantities – Spills will be promptly controlled, contained, and cleaned – Contaminated materials will be properly containerized and labeled while awaiting disposal – Disposal will be in accordance with appropriate local, state, and federal regulations	– Spill kits available – Secondary containment structures

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified
Fire extinguishers	– Monthly inspections will be performed – Annual Inspection will be performed	– Contractors to have knowledge of proper use
Barricades	– Inspect before use	– Contractors to have knowledge of proper use
PPE=Level D	– Inspect before use	– Contractors to have knowledge of proper use

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Process Oversight and Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Vehicle loading/unloading	Slippery surfaces on and around vehicle	– Check loading area and vehicle surfaces for water, oil, etc., prior to moving equipment	– Adsorbent towels for petroleum
	Moving heavy or awkward equipment	– Utilize adequate number of personnel to move equipment; use hand trucks if available – Use trucks with lift gates whenever possible	– Lift gates, hand trucks, loading dock if available
	Unsecured equipment	– Properly secure all equipment with rope and anchor points on trucks – Load heaviest equipment farthest forward in vehicle	– Rope, anchor points
Travel to/from work areas	Heavy equipment operation	– Be aware of heavy equipment operation and movement – Consider extensive blind spots in heavy equipment when approaching moving equipment	– Awareness of equipment – Proper communication – Coordination with flagmen
	Difficult terrain	– Use proper vehicles for accessing work locations	– 4WD vehicles as necessary
	Drop offs at roadway edges	– Be aware or roadway markings – Maintain proper speeds	– Roadway awareness
	General traffic hazards	– Drive defensively – Use seatbelts	– Seat belts for all passengers
Site walk downs and oversight	Uneven ground, holes, stumps	– Be aware of surroundings and wear appropriate boots – Stand still during videotaping or photography or use a buddy system / spotter while walking	– Proper work boots
	Motor vehicle traffic / heavy equipment	– Access vehicle and equipment from passenger side, not road side of vehicle – Wear reflective vests, setup traffic warnings as appropriate, particularly on blind corners and hills	– Reflective vests, traffic markers

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Process Oversight and Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Site walk downs and oversight (continued)	Overhead and eye hazards	– Avoid walking through wooded areas – Whenever possible, stay out of active work areas such as drill sites and areas where heavy equipment is operating – Wear hard hats and eye protection	– Hard hats, eye protection.
	Chemical hazards / Exclusion Zones	– Do not enter Exclusion Zones unless it is absolutely necessary to perform activity – If Exclusion Zone entry becomes necessary, compliance with 29 CFR 1910.120 will be necessary including training, and appropriate PPE usage – Upon exiting Exclusion Zones, thoroughly wash hands and face, remove materials from clothing	Level C or D PPE
	Biological hazards: ticks, spiders, bees, wasps, mosquitoes, poison ivy/oak/sumac	– Check area for obvious signs of poison ivy, oak, and sumac – Be aware of areas that are likely to contain bees/wasp nests, use DEET as necessary to prevent exposure to ticks, tape pant legs to boots if necessary and wear light colored clothing	DEET, duct tape, light colored clothing, ivy-bloc

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Vehicles	Daily inspections will be conducted	Contractors to have driving skills and licenses
Surveying, photography, or videotaping equipment	Inspect before use, inspect after use for potential contamination	Contractors to have knowledge of proper use

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Railcar Loading**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Walk rail line to identify and remove debris and obstructions	Slips, trips, and falls	– Work Areas and means of access shall be maintained safe and orderly – Avoid walking on rail tracks – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified	
	Vehicular traffic / problems	– Trackmobile and railcars stationary for this task	
	Back injuries	– Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate for use	
Locomotive operation	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Secure all radios, cell phones, and equipment	
	Eye injury	– Safety glasses with side shields that meet ANSI Standard Z-87 will be worn	
	Slips, trips, and falls	– No passengers on trackmobile – Spotters to assess footing while performing job – Don’t walk on tracks – Clear ice and snow – Operator use three points of contact when climbing into and out of the cab	

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Railcar Loading**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Locomotive operation (continued)	Struck against/by	– Operator to have completed training and have current heavy equipment license and driver's operator license – Personnel will understand and review hand signals – All personnel will wear ANSI Type II high visibility vests – Personnel will keep 25 feet away from railcars and trackmobile when they are moving – Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all time – Ground personnel will not stand directly behind heavy equipment when it is in operation – Eye contact with operators will be made before approaching equipment – Clear the area of all non-essential personnel – All machines will be equipped with working backup alarms adequate for the background noise – No manual uncoupling of railcars	
	Pinch points	– Manual connect of railcar to trackmobile – Wear gloves while making connection – Railcar and trackmobile stable before attempting connection	
Stage, line, load, wrap, decontamination / inspect gondola empty gondolas Switching or cars	Struck against/by	– No manual uncoupling of railcars	
	Vehicle traffic, public roads	– Proper signage on cars – Defensive driving – Clear visibility – Awareness of crossing traffic	
	Slips, trips, and falls	– Use ladder to climb into gondola – Maintain three points of contact while climbing in and out – Keep plastic from walking paths	– PPE – Awareness of trip hazards

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Railcar Loading**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Stage, line, load, wrap, decontamination / inspect gondola empty gondolas Switching or cars (continued)	Back strain from lifting	– Assess load weight before attempting lift – Obtain assistance when needed – Lift with legs after securing load	– Buddy system when lifting
	Struck against/by	– Personnel will understand and review hand signals – All personnel will wear ANSI Type II high visibility vests – Personnel will keep 25 feet away from railcars and trackmobile – Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times – Ground personnel will not stand directly behind heavy equipment when it is in operation nor stand under loads – Eye contact with operators will be made before approaching equipment – Clear the area of all non-essential personnel – All machines will be equipped with working backup alarms adequate for the background noise – Wear PPE including gloves – Use new straps with ratchet or buckle; bungee cords or elastic straps not preferred	– Equipment to position pipe and welder – PPE, awareness of other workers
	Exposure to dust, silica	– Wear Level D PPE at levels up to exposure limit 0.050 mg/m^3, above that concentration, Level C PPE will be required – Perform thorough cleaning of hands and face upon departing Exclusion Zone – Secondary containment for all hazardous materials – Stay upwind whenever possible – Minimize dust generation	– PPE – Dust control measures
Weigh full railcars	Pinch points, struck by	– Wear gloves – Proper positioning – Communication with locomotive operator	

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Railcar Loading**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Front end loaders	Daily inspections will be conducted	Contractor to have driving skills and licenses
Fire extinguishers	Monthly inspections will be performed	Contractors to have knowledge of proper use
Rail equipment	Per railroad requirements	TVA HSE training per Procedure 445

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual material handling	Slips, trips, and falls	– Work areas and means of access shall be maintained safe and orderly – Even terrain will be utilized as unloading areas – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified – Fall protection will be used when working at unprotected heights greater than 4 feet	– Fall arrest / protection systems – Proper stair railings
	Vehicular traffic/problems	– Spotters will be used when backing up trucks and moving equipment – Heavy equipment will be equipped with backup alarms – When work areas impact vehicle ways, traffic control markings, and/or a flagman will be used	– Functioning backup alarms
	Weather	– Personnel will be instructed in heat stress/cold stress recognition and prevention – Personnel must notify the SSHO if symptoms of cold/heat stress are perceived in any member of the crew, including self – Work/rest regimes and personnel monitoring for workers will be instituted per the SSHO based on ambient conditions and condition of personnel – Air temperature, humidity, and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary – Drinking liquids will be available and used for rehydration during breaks – Work will be conducted during warmer/cooler hours of the day, if necessary and feasible – Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, or lightning	– Drinking liquids – Shaded break areas – Emergency coordination

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual material handling (continued)	Back injuries	– Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate for use – Proper paths of travel will be noted and followed during manual material handling	
	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area – All radios, cell phones, and equipment will be secured – Tools and parts will be lifted or carried, not tossed – Personnel will not climb ladders while carrying equipment in hand – Stop blocks will placed and secured at an appropriate setback to prevent mobile heavy equipment such as Lulls or loaders from approaching the bulkhead edge too closely	– Steel-toe boots
	Overhead hazards	– All overhead hazards will be identified prior to commencing work operations – Personnel will wear hard hats that meet ANSI Standard Z-89.1	– Hard hats
	Noise	– Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs) – All equipment will be equipped with manufacturer's required mufflers – Proper use of vibratory hammer to minimize noise generation	– Ear plugs / muffs

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual material handling (continued)	Eye/face injury	– Safety glasses with side shields meeting ANSI Standard Z-87 will be worn – Face shields will be worn over safety glasses during grinding, wire wheel work, or other activities posing face hazards – Proper guards will be used on all equipment such as grinders, cut-off wheels, and saws	– Safety glasses
	Struck by/against	– Personnel will understand and review hand signals; flaggers will be used when loading trucks – All personnel will wear ANSI Type II high visibility vests – Personnel will keep out of the swing radius of heavy equipment; swing radius will be barricaded or delineated as appropriate – Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times – Ground personnel will not stand directly behind heavy equipment when it is in operation – Eye contact with operators will be made before approaching equipment – All machines will be equipped with working backup alarms adequate for the background noise	– High visibility vests – Hazard markings – Flaggers – Flags
	Electrical	– All electrical tools and equipment will be equipped with GFCI – All electrical work will be done by licensed electricians – Electrical cords will not be laid across roads where vehicular traffic may damage the cord – All extension cords will have a three blade grounding plug, all outlets will accommodate a three-prong plug	– Functioning GFCIs

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual material handling (continued)	Electrical (continued)	– Portable generators will placed on solid ground prior to starting; generators will not be run from the back of trucks unless properly grounded – All equipment will stay a minimum of 20 feet from overhead energized electrical lines (50kV or less); the distance will increase 4 feet for each additional 10kV above 50kV	
	Hot work/fire	– All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids, allowable container size will comply with TVA TSP 906 – Fire extinguishers will be installed at all areas designated for flammable and combustible storage – Internal hot work permits will be issued by the SSHO or HSS. – A fire watch will remain in the vicinity during hot work and for at least 30 minutes after hot work has been completed – Flammables will remain at least 50 feet away from hot work activities, combustibles at least 35 feet – Fire extinguishers will be inspected at least monthly and re-certified annually – Hot work will not occur in confined spaces without SSHO approval – Proper flammable storage areas will be utilized as necessary and as a minimum comply with TVA TSP 906, Section 3 – Oxyfuel gas welding and cutting equipment shall be configured and maintained per the requirements of TVA TSP 815, Section 8	– Hot work permits – Fire extinguishers – Fire watch

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual material handling (continued)	Spills	– Secondary containment will be utilized for all fuel/chemical storage areas – Appropriate spill kits will be available; consideration will be taken for spills on water – All spills will be reported to the SSHO or appropriate designee – Verification will be made that spill volume does not exceed reportable quantities – Spills will be promptly controlled, contained, and cleaned – Contaminated materials will be properly containerized and labeled while awaiting disposal – Disposal will be in accordance with appropriate local, state, and federal regulations	– Spill containment / cleanup materials – Emergency notification means
Boom deployment or sampling	Falling into Rim Ditch	– All persons within 6 feet of Rim Ditch edge shall wear Type V PFD per requirements of TVA TSP 306 – Nonslip surfaces will be provided on all working decks, stair treads, platforms, catwalks, and walkways – An adequate number of throw rings will be maintained along the Rim Ditch and be properly marked for quick identification	– PFDs – Throw rings
Pipe relocation, movement	Struck by/against	– Personnel will understand and review hand signals – Personnel will stand clear of pipe as it is being moved; pipe will not be positioned by hand during movement – Pipe ends will be controlled and will not be allowed to “whip” as pipe is moved around bends – Personnel operating positioning winches will be protected from whip-back in the event of line failure	

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Fly ash removal from Rim Ditch	Heavy equipment	– Area around Rim Ditch where equipment is in operation will be designated as no pedestrian – All personnel onsite to wear high visibility vests – Spotters and flagmen will be used when large numbers of trucks are being loaded	– High visibility vests – Flaggers – Flags
	Wall collapse	– Heavy equipment must remain adequately back from the edge of the Rim Ditch – During dipping operations, operators must be careful not to undercut their location within the Rim Ditch since this could destabilize their foundation – No personnel are to be in the area of the Rim Ditch edge during active dipping in the area	
	Potential exposure to chemical constituents of fly ash	– In the immediate area of the Rim Ditch, fly ash is wet, this will minimize the likelihood of exposure – In the event material begins to dry, dust control measures will be implemented – Operators must keep equipment doors and windows closed during operation – If necessary, HEPA HVAC filters can be installed in equipment	– Enclosed equipment cabs – HEPA filters in HVAC – Dust control measures

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Rim Ditch Management**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Spill control materials	– Daily safety inspection of spill control materials will be conducted	– Personnel will be given training on how to respond to spilled materials
Deck/working surfaces	– Daily inspections for oil/grease buildup will be conducted	– Requirements for house keeping will be reviewed
Lighting/signaling system	– Daily inspections will be made	– Operators will be trained in proper use of these safety systems
Crane, Cherry Picker, Lull all-terrain forklift, pickup trucks	– Inspections will be performed on equipment prior to each use – Daily crane inspections, annual certification – Pre-lift checklist, critical lift paperwork as necessary	– Qualified operators will be used for equipment operation – Document calculations, inspections and checklist
Fire extinguishers	– Monthly inspections will be performed – Annual re-certification will be performed	– Personnel will be given instructions on proper use of fire extinguishers
Fall protection: Harnesses, lanyards, anchor points	– Daily inspection of all fall arrest systems will be conducted	– Personnel will be trained on fall protection requirements
Wind, weather instruments	– Annual calibration	– Site safety personnel will review equipment specifications and manufacturer's documentation prior to using weather monitoring equipment
Rigging	– Daily inspection for all rigging – Hoisting chains must have a documented inspection at least annually	– Personnel will be trained in proper rigging techniques and rigging inspection protocol
Traffic control equipment	– Routine inspections will be made	– Personnel will be trained in proper use and placement of these devices

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Sampling from Boats**

Date of Analysis: 5/12/09

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Mobilization of equipment and supplies	Slips, trips, and falls	– Work Areas and means of access shall be maintained safe and orderly – Even terrain will be utilized as unloading areas – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified – Ensure that loads are properly distributed in all small boats	Adequate space for staging equipment
	Vehicular traffic / problems	– Spotters will be used when backing up trucks and moving equipment – When off loading a boat, never back the vehicle so far into the water that the back tail pipe is under water – Ensure you have sufficient power to pull the boat out of the water once on the trailer	
	Back injuries	– Site personnel will be instructed in and use proper lifting techniques – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used in lieu of mechanical devices	
	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Secure all radios, cell phones, and equipment	– Steel-toe boots
	Overheads hazards	– Personnel will be required to wear hard hats that meet ANSI Standard Z-87	– Hard hats
	Eye injury	– Safety glasses that meet ANSI Standard Z-87 will be worn	– Safety glasses

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Sampling from Boats**

Date of Analysis: 5/12/09

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Mobilization of equipment and supplies (continued)	Struck by/against	– Personnel will understand and review hand signals – Caution will be used offloading the boat from the trailer – Clear the area of all non-essential personnel – All boats will be securely anchored or docked – docked boats will be positioned with minimum two lines – Ensure the boat is properly secured to the boat trailer before transporting – Ensure there is sufficient room to drive through when trailering the boat on narrow streets – All machines will be equipped with backup alarms	– Hand signals – Functioning back-up alarms
Boat (watercraft) access, movement, and sample collection	Uneven terrain	– Watercraft will be entered and exited from designated areas only – Personnel will avoid walking across rip rap areas or steep embankments to enter or exit watercraft	– Adequate boat access
	Falling overboard and/or stranding	– All persons onboard will wear USCG-approved PFDs per the requirements of TVA TSP 306 – A Float Plan will be completed by the operator and filed with reliable shore personnel – All persons onboard will remain seated, except when sampling – Ensure the drain plug is tightly secured in the boat – Maximum weight capacity for watercraft will not be exceeded – Watercraft will not be operated without a minimum of two personnel onboard – Watercraft will not be used without shore support personnel – Personnel onboard watercraft must be in constant radio contact with shore personnel	– PFDs – Float Plan – Adequate means of communication

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Sampling from Boats**

Date of Analysis: 5/12/09

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Boat (watercraft) access, movement, and sample collection (continued)	Heat stress	– Personnel will be instructed in heat stress recognition and prevention – Personnel must notify the SSHO if symptoms of heat stress are perceived in any member of the crew, including self – Heat stress management will be conducted – Work/rest regimes and personnel monitoring for workers will be instituted per the SSHO based on ambient conditions and condition of personnel – Air temperature and humidity will be monitored – Drinking liquids will be available and used for rehydration during breaks – Work will be conducted during cooler hours of the day, if possible	– Drinking liquids – Shaded and / or cooled areas for rest periods
	Struck by/against	– Personnel will understand and review hand signals – All machines will be equipped with backup alarms – Watch for other boats in area, avoid close calls or collisions – Watch for wake from other boats – Watch for (know their locations or mark with buoys) objects hidden under water at higher tides (i.e., pilings, islands, anchor lines) – Ensure the air horn on each boat used is in proper work order	
	Exposure to site contaminants	– Personal protective equipment will be worn if needed, at the discretion of the SSHO – For this activity it is not anticipated that fly ash exposures will be a concern	

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Sampling from Boats**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Support boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified
Fire extinguishers	– Monthly inspections will be performed	– Contractors to have knowledge of proper use
Heavy equipment	– Inspect before use and document	– Contractors to have knowledge of proper use
PPE=Level D	– Inspect before use	– Contractors to have knowledge of proper use

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Shoreline Dredge Support**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Construct Flexi-Float™ barges Maintain ramps and launch points	Slips, trips, and falls	– Work areas and means of access shall be maintained safe and orderly – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified	– Proper footwear
	Struck by/against	– Stay clear of heavy equipment – Maintain eye contact with operators – Proper positioning – Personnel wearing proper PPE	– PPE – Good line of vision
	Back injuries	– Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate for use	– Lifting assist devices
Moving spuds	Striking personnel and equipment	– Use heavy equipment in good working order – Workers clear of spud swing radius	– PPE – Good eye contact with operators – High visibility vest and PFD
	Unstable barges	– Understand weigh limits of barges – Ties down equipment when necessary – Personnel to wear USCG-approved PFD	– Calculation of barge stability – PPE
Transporting supplies to dredges on water	Struck by/against	– Operator completes boating safety course – All personnel wearing PFDs and proper PPE – Crew knows spill response practices – Obey boat capacity requirements	– Boat in good shape and passed inspection – PPE – Fuel spill cleanup – Knowledge of obstructions in water

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Shoreline Dredge Support**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Transporting supplies to dredges on water (continued)	Vehicle accidents	– Seatbelts worn always – No talking on phones while operating vehicles – Obey traffic signs and travel paths	– Defensive driving
Unloading supply trucks/moving supplies to onshore storage	Struck against/by	– Operator to have completed training and have current heavy equipment license and driver's operator license – Personnel will understand and review hand signals – All personnel will wear ANSI Type II high visibility vests – Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times – Ground personnel will not stand directly behind heavy equipment when it is in operation – Eye contact with operators will be made before approaching equipment – Clear the area of all non-essential personnel – All machines will be equipped with working backup alarms adequate for the background noise	– PPE – Clear line of vision
	Vehicle traffic	– Defensive driving – Clear visibility – Awareness of crossing traffic	– Defensive driving course
Fueling dredges and on-land vehicles	Fuel spills	– Reporting to required agencies – Public relations concerns	– Emergency PPE – Fuel spill cleanup kit – Notify TVA immediately as required

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Shoreline Dredge Support**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Front end loaders, fork trucks	– Daily inspections will be conducted	– Contractor to have driving skills and licenses
Fire extinguishers	– Monthly inspections will be performed	– Contractors to have knowledge of proper use
Hand tools	– Daily inspections before use	– Contractors to have knowledge of proper tool condition
Dredges, barges, and boats	– Initial inspection by qualified person (USCG) – Daily inspections of engines and boat structures will be conducted	– Boating safety training per TVA requirements – Contractor to have expertise – Inspectors to be qualified

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Pre-job planning	Injuries resulting from unauthorized/untrained employees or trained, experienced employees becoming complacent.	Use Resource Stewardship Job Safety Checklist at a minimum, yearly. Read and understand the manufacturers/owners operating instructions and safety rules or be trained by a qualified person on the contents of manufacturers/owners operating instructions and safety rules.
Pre-trip inspection	Problems undetected during the pre-trip inspection could result in serious injury or property damage.	The driver is the key to trailer safety, ensuring that the tow vehicle and trailer can handle the load and are safe for the road and comply with all local, state, and federal regulation.
		Begin by checking all tires for proper inflation. Check to see that brakes and all lights are working on both the vehicle and the trailer. The trailer framework and structure should be intact and in good condition.
Hook-up	Failure to property engage the hitch mechanism and securely lock the latch mechanism can cause the trailer to become detached from the tow vehicle while traveling which could cause serious injury or property damage.	Methods for hooking trailer into vehicle differ from manufacturer to manufacture, but certain, basic rules always apply. Learning these rules now can prevent big problems later.
		If at all possible, use two people when connecting the trailer. From the vehicle, the driver watches in the rear view mirror as the assistant direct him/her. Whatever you do, never get between the vehicle and trailer.
		Mirrors on the truck should be of adequate size and type and be properly adjusted to provide good visibility of the trailer load.
		During trailer hook-up, set manual transmissions in first or reverse, automatic transmissions should be set in park. Turn off the ignition and set the parking brake. The tires of the unattached trailer should be chocked front and back.
		Attach the trailer and secure it in place. Attach the two safety chains, which all trailers shall have, crossing them beneath the hitch with just enough slack to allow the vehicle to turn easily. Some vehicle/trailer connectors are equipped with an air-powered locking system. It's necessary to attach the breakaway switch cable or airline connections.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Hook-up (continued)	Mismatching the ball-coupler sizes can cause the trailer to uncouple as your travel which could cause serious injury or property damage.	Also acquaint yourself with the ball-coupler hitch. It comes in different sizes, which do not interconnect. Check the outside of the coupler for the manufacturer's suggested size and weight limit of the hitch.
		Verify that the hitch lock mechanism is down and secured and that any pins or locking devices are in place. Check the lighting plug for rear running lights, brake lights, and turn signals. Is it clean and securely installed? Does everything on the vehicle and trailer operate correctly?
		The trailer jack should be at least 8 inches off the ground to accommodate dips and bumps in the road.
Trailer loading	Serious injury or property damage can result from improper trailer loading.	Loading requires getting on and off the trailer bed. When possible, use the three-point stance for safe mounts and dismounts. This means that at least three limbs should be touching the trailer at all times for maximum stability. Use handholds and footholds on your equipment, whenever possible, for additional safety.
	A little slip can cause an accident.	Keep the trailer deck free of dirt, oils, and debris. Be extra cautious when the equipment is wet (i.e., frost or icy conditions). Steel decks are especially slippery. It's worth emphasizing that a trailer is for equipment, materials, supplies, etc.—not for passengers. No passengers are allowed on moving trailers. And, as the driver, you're responsible for whatever happens as a result.
	Serious injury or property damage can result in improper use of ramps.	First and foremost, ensure that the trailer and equipment that you are about to match are compatible, especially the tires on the equipment. Use caution on ramps when using them to access trailer. Load on level ground with the trailer wheels blocked. Unhook and lower ramps. If unloading on an asphalt surface, take caution that you do not damage the asphalt. If the equipment you are loading has roll over protection system, put your seat belt on before loading onto the trailer. Drive the equipment in line with the ramps. If the ramps are adjustable, ensure that they are in line with the equipment tires. Load the equipment slowly.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Securing the load	Failure to secure the load property can result in personal injury or property damage.	It's always safer to secure the load from the ground rather than running the risk of falling off the trailer.
		Attach the load securely to the trailer by running the tiedowns from the load to the trailer. Place tiedowns at the front and rear of the load, pulling in opposite directions to put tension on the load.
		There should be no kinks, no twisted or frayed tiedowns, and all tiedown material should be in serviceable condition.
		Fasten tiedowns to solid framework or something stable. Binders/tension adjusters should be located on the driver's side of the truck for better visibility. On the other hand, if you will be loading and unloading in traffic, place binders/tension adjusters on the passenger side of the trailer.
		Hook binders/tension adjusters so that you pull downward to tighten. Tighten binders/tension adjuster snugly, but do not use your body weight to tighten.
Loading materials	Shifting the load and exceeding the rated capacity of the trailer or tow vehicle can lead to serious personal injury or property damage. When loading materials by hand, back injuries are possible.	You'll have to do a little arithmetic before you load implements or materials to ensure that the weight of the load does not exceed what the trailer can handle.
		As a TVA vehicle and trailer operator you will run up against several standard equipment transportation terms that will help you when you are loading.
		Gross axle weight rating is the maximum weight the trailer axle or axles should carry.
		Gross vehicle weight rating is the most of the trailer, plus everything on it, should weigh. The gross vehicle weight of some older trailers was based on a 35-mph limit. Make sure that the rating of your trailer is figured at today's highway speeds.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Loading materials (continued)	Shifting the load and exceeding the rated capacity of the trailer or tow vehicle can lead to serious personal injury or property damage. When loading materials by hand, back injuries are possible. (continued)	Most of today's trailers are also rated according to **maximum load weight**, which is the trailer's actual load-carrying capacity. For example, if the maximum load weight is 4,800 pounds and your equipment weighs 4,500 pounds, you know that you are just within weight limits.
		The vehicle must also be capable of handling the **tongue load**, which is the amount of weight placed on the vehicle hitch by the loaded trailer. Your trailer should have a federal; I.D. tag, giving the **tongue load rating** and **gross vehicle weight rating**.
		In a nutshell, the vehicle's towing capacity must meet or exceed the combined weights of the trailer and the equipment and materials being towed.
		Determining the weights of all materials and implements makes you job much easier.
		Lift the load slowly and carefully, so that it cannot swing into or fall on top of the person steadying the load. The helper can use a stay pole to steady the load from a safe distance.
Tiedown and securing of materials	A load that is improperly secured can fall off the trailer and result n stiff fines or a traffic accident.	Well secured cargo not only stays on the trailer bed, it does not shift at all. Most state Department of Transportation regulations require that the breaking strength of the tiedown assembly is more than adequate to secure the load.
		Do not wedge implements between the axles or between the bucket and front tires of the equipment and call them secure. Implements slide around easily on wood and steel trailer decks, so tiedown the load from front to back and side to side.
		The easiest way to secure bulk items is with low sides on the trailer. Bulk materials should be inside the container of the trailer and not heaped above the sides.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Tiedown and securing of materials (continued)	When hooking straps into place, avoid possible injury by standing to one side.	It's a good idea to use cover tarps with all lightweight, loose materials, which can fly off the trailer and blow into oncoming traffic. Rubber straps can be used for tension on the tarp so that it does not flap in the wind, but do not rely on straps to secure the load.
	Overloading your trailer can cause injury, property damage, traffic accidents, or state fines.	Typically, loads extending 4 to 8 feet beyond the tail lights require a red flag. Loads extending 8 feet or more require a caution light and a state permit. Most states have laws limiting the width of a trailer and the maximum overhang allowed on the sides. Check with your state Department of Transportation if you have questions.
Safely backing the trailer	Unsafe trailer backing can cause personal injury or property damage.	Before you back up with a trailer, walk the area you'll be backing through. Check for small obstacles and obstructions that might not be visible from inside the vehicle. Move anything that is not permanently fixed and mentally visualize obstacles that remain, such as fire hydrants, traffic signs, and utility poles. Also check the condition of the terrain. It is easy to get a loaded trailer stuck in a rut or mud hole. If you are backing into or through traffic use a flagman to stop the traffic while you maneuver.
		Backing a trailer can be tricky. To back a trailer, turn the steering wheel in the opposite direction of where you want the trailer to go. A good way to simplify the procedure is to grasp the steering wheel with one hand. When you want the trailer to go right, turn the wheel counter clockwise. To make the trailer go left, turn the wheel clockwise. Turn gradually. The biggest mistake beginners make is over compensating and creating a series of "S" curves.
		Know the width of your trailer and the width of the area you are passing through. Choose a post or fixed object on the driver's side of the vehicle and use it as a reference point. By staying relatively close to your reference point you can avoid hitting anything on the blind side of the trailer.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Safely backing the trailer (continued)	Unsafe trailer backing can cause personal injury or property damage. (continued)	You may need to jack-knife the trailer or turn it very sharply to position it appropriately for unloading. As you begin the jack-knife, watch the trailer come around in the opposite mirror. Do not over extend the angle at which the trailer is jack-knifed or you could pull on the safety chains or light plug, damaging the hitch.
		Beware of blind spots. You may have to stop, set the parking brake and get out to see what the condition is behind the vehicle. If you have a helper, he/she can check for you.
Transporting the loaded trailer	A load that is improperly secured can fall off the trailer and result in fines or a traffic accident. Shifting loads may also cause serious injury or property damage.	Transporting often causes the load to shift and settle so you may need to cautiously pull off the road, check the load, and retighten or rebind the load.
		A vehicle pulling a loaded trailer requires a much greater stopping distance than a conventional vehicle. Always put additional space between yourself and the vehicle in front of you.
		As you drive, check your mirrors frequently for loose assemblies. The minute you notice a tiedown or connection coming loose, pull over at the first safe opportunity and re-secure the load.
		Listen for thumps, bumps, and rattles. Smell for odors such as burning insulation, hot metal, burning rubber, and hot oil. Look for defects in wiring, lighting, cables, and couplings. Report any problem to your supervisor right away.
		A weaving trailer is a major warning sign. If your trailer starts to weave, the load is probably unbalanced. Put on the directional signal, wait for the first safe opportunity and pull off the road to check the trailer and load.
Storage	Dirt, rocks, and debris left on trailers can become flying objects creating personal injury and property damage.	Clean and inspect trailer before storage.
		For cleaning, park the trailer in an area where cleaning operations will not create house-keeping problems.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Trailer Operations**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Storage (continued)	Debris left on the trailer has the potential to cause slips, trips, and falls.	Remove all accumulation of dirt, debris, dust, and grease before retiring the trailer for the day.
		A stiff broom should be used to remove dry materials.
		A water hose may then be used, with detergent if necessary, to remove any excessive grease or soil deposits. Do not cause water to be forced into bearing seals, electrical components, or fluid reservoirs by use of high velocity streams. Note any dirt accumulations caused by leakage of fluids or lubricants and report to your supervisor.

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling	Boat instability	– An engineering review may be required to determine placement location of equipment on watercraft, allowable list, and capacity – The craft will be completely spudded in or stabilized prior to extending equipment arms, booms, or moving materials – Crane mats or similar material will be used to span across the shore area and watercraft equipment transfer – Once equipment is placed according to the engineering assessment, the equipment will be secured at appropriate anchor points	– Engineering review – Crane mats – Anchor points and tiedowns
	Work zones	– One end of the vessel will be designated as the support area for the storage of clean materials; this will include the head, drinking water, and entry/exit location on the watercraft – The support area will also be the location for the crew to stand while the spud hoisting/lowering is ongoing	
	Slips, trips, and falls	– Work areas and means of access shall be maintained safe and orderly – Even terrain will be utilized as unloading areas – On-shore walkways will be prepped prior to carrying materials on or off the watercraft – Tripping and poor footing hazards will be repaired as they are discovered or clearly identified	– Designated walkways maintained
	Vehicular traffic/problems	– Spotters will be used when backing up trucks and moving equipment in congested areas – Heavy equipment will be equipped with backup alarms – When work areas impact vehicle ways, traffic control markings, and/or a flagman will be used	– Spotters – Backup alarms – Flagman

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Inclement weather	– Personnel will be instructed in heat stress/cold stress recognition and prevention – Personnel must notify the SSHO if symptoms of cold/heat stress are perceived in any member of the crew, including self – Cold/heat stress management will be conducted in accordance with the site Cold/Heat Stress Program (Temperature Extremes) – Work/rest regimes and personnel monitoring for workers will be instituted per the SSHO based on ambient conditions and condition of personnel – Air temperature, humidity, and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary – Drinking liquids will be available and used for rehydration during breaks – Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, and lightning – UV protection for eyes and skin should be utilized when working on the water	– Drinking fluids – Cooled / heated break areas – Ambient monitoring results – UV protection – Daily forecast
	Back injuries	– Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting – Mechanical devices will be utilized when possible to reduce manual handling of materials – Team lifting will be used when mechanical devices are not appropriate for use – Proper paths of travel will be noted and followed during manual material handling	– Adequate walkways for traveling with manual loads

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Dropped objects	– Steel-toe boots meeting ANSI Standard Z-41 will be worn – Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area – Crane capacity will be verified for utilized configuration and equipment pick/placement positions. If pick or placement locations change, re-verification of capacity must be made prior to lifting – All cranes will have appropriate annual inspections and only be operated by personnel possessing an appropriate level equipment operator's license – All rigging will be performed by TVA qualified personnel – All rigging (slings, cables, chokers, etc.) will be inspected prior to use – Engineered lifting lugs or appropriate slings shall be used for lifting – Softeners will be used on equipment corners when lifting with synthetic slings – Critical lift procedures will be initiated for lifts involving >75% of the cranes capacity, on/over water picks or other criteria outlined in the TVA Safety Manual – All radios, cell phones, and equipment will be secured – Tools and parts will be lifted or carried, not tossed – Personnel will not climb ladders while carrying equipment in hand	– Steel-toe boots – Hard hats – Inspected cranes – Trained operators, riggers – Critical lift procedures when applicable

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Overhead hazards	– All overhead hazards will be identified prior to commencing work operations – Personnel will wear hard hats that meet ANSI Standard Z-89.1 – All ground personnel will stay clear of suspended loads and overhead work – Work areas will be barricaded and/or posted showing the limits of overhead hazards including load path of travel – All equipment will be provided with guards, canopies, or grills to protect the operator from falling objects – Appropriate protection from falling equipment/materials will be utilized in the event workers are required to work below other crews	– Hard hats
	Noise	– Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs) – All equipment will be equipped with manufacturer's required mufflers	– Hearing protection – Equipment mufflers
	Eye/face injury	– Safety glasses with side shields meeting ANSI Standard Z-87 will be worn – Face shields will be worn over safety glasses during grinding, wire wheel work, or other activities posing face hazards – Proper guards will be used on all equipment such as grinders, cut-off wheels, and saws	– Safety glasses – Face shields

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Vibecore Sampling on Water**

Date of Analysis: 5/12/09

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Struck by/against	– Personnel will understand and review hand signals – All personnel will wear ANSI Type II high visibility vests – Personnel will keep out of the swing radius of heavy equipment; swing radius will be barricaded or delineated as appropriate – Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times – Ground personnel will not stand directly behind heavy equipment when it is in operation – Eye contact with operators will be made before approaching equipment – All machines will be equipped with working backup alarms – Tag lines will be used to help control suspended loads – Workers will be made aware of potential pinch-points during offloading and assembly of equipment (bolting flanges, process piping, etc.) and keep hands free from potential pinch points – Proper lockout procedures will be followed when personnel are required to work on mechanical equipment – When necessary, equipment will be blocked, chocked or, supported to prevent movement while workers are in danger areas – Pneumatic lines will be properly secured with fittings pinned when necessary – If the line pressure does not drop when connections are parted there will be whip checks installed	– High visibility vests – Barricades or caution / danger tape – Tag lines – LOTO equipment – Whip checks
	Electrical	– All electrical tools and equipment will be equipped with GFCI – All electrical work will be done by licensed electricians – Electrical equipment will be properly locked out during equipment installation and connection	– GFCI outlets – Proper extension cords

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Vibecore Sampling on Water**

Date of Analysis: 5/12/09

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Electrical (continued)	– Each worker involved in lockout will have their own uniquely keyed lock installed on the lockout device – Equipment will not be energized until it has been verified that all connections are properly secured and all personnel have removed their own locks from the lockout device – Tags will not be used in lieu of lockout devices – Electrical cords will not be laid across roads where vehicular traffic may damage the cord – All extension cords will have a three-blade grounding plug; all outlets will accommodate a three-prong plug – Portable generators will placed on solid ground prior to starting; generators will not be run from the back of trucks unless properly grounded – All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50kV or less); the distance will increase 4 feet for each additional 10kV above 50kV	
	Hot work/fire	– All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids; allowable container size will comply with TVA requirements – Fire extinguishers will be made available on each watercraft and placed within 15 feet of an operating engine – Internal hot work permits will be issued by the SSHO – Flammables will remain at least 50 feet away from hot work activities; combustibles at least 35 feet – Fire extinguishers will be inspected at least monthly and re-certified annually – Hot work will not occur in confined spaces without SSHO approval	– Safety cans for flammable / combustible liquids – Hot work permits – Fire extinguishers

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and vibracore (sonic) sampling (continued)	Spills	– Secondary containment will be utilized for all fuel/chemical storage areas – Appropriate spill kits will be available; equipment will be suitable for use on water – All spills will be reported to the SSHO or appropriate designee – Verification will be made that spill volume does not exceed reportable quantities – Spills will be promptly controlled, contained, and cleaned Contaminated materials will be properly containerized and labeled while awaiting disposal – Disposal will be in accordance with appropriate local, state, and federal regulations	– Spill response materials – Emergency communication means
Barge and boat (watercraft) movement	Falling overboard and/or stranding	– All persons onboard will remain seated, except when working – All personnel shall wear USCG-approved PFDs per the requirements of EM 385-1-1, Figure 5-1 – Nonslip surfaces will be provided on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways – All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards – An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of EM 385-1-1, Section 05.H.03A – All throw rings will be USCG approved – Maximum weight capacity for watercraft will not be exceeded – Dredges, barges, and decks will be equipped with perimeter guardrails – Watercraft will not be used without shore support personnel	– PFD – Throw rings – Safety skiff

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Barge and boat (watercraft) movement (continued)	Falling overboard and/or stranding (continued)	– Personnel onboard watercraft must be in contact with shore personnel – All personnel working on watercraft will be trained in man overboard emergencies; drills will be conducted to verify personnel are aware of their responsibilities – A safety skiff (backup boat) will be available during on water activities	
	Water craft operation	– All boat pilots shall be familiar with the “Rules of the Road” that regulate movement of boat traffic within the harbor and will have appropriate TVA training – Locations of rocks, ledges, and manmade surface obstructions will be noted within the study area – these will be given a wide berth – All watercraft must have required USCG-approved lighting and signaling devices – Float Plan submitted for each watercraft operation each day	– Float Plan
	Sinking boat/barge damage	– All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor – The load ratings of barges/boats will be strictly adhered to; overloading of vessels is prohibited – In the event the barge/boat becomes grounded, no attempt will be made to move the barge/boat until the load is lightened or enough water returns to re-float it – Oil absorbent booms will be kept onboard in the event of a spill	– Boat inspections – Spill response materials

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Barge and boat (watercraft) movement (continued)	Struck by/against	– Personnel will understand and review hand signals – Boats will not enter areas between the operating dredge craft and their anchor points without explicit clearance from the dredge operator – Watch for other boats in area, avoid close calls or collisions – Watch for wake from other boats – Ensure the air horn on each boat used is in proper work order	– Air horn – Means of communication with other craft
	Severe weather	– National weather forecasts will be monitored daily for predicted inclement weather – The field investigations lead will call for local conditions and forecast each morning – All personnel shall be aware of the forecast and keep an “eye to the sky” – Work will be postponed in the event of strong winds or at times of very poor visibility – In the event of lightning in the area, work will cease at the direction of the Jacobs field supervisor or SSHO, and will not proceed further until return to work permit is issued	– Daily forecast – Means of communication

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project Date of Analysis: 5/12/09
Activity: **Vibecore Sampling on Water**

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Barge	– Initial inspection by a Registered Marine Surveyor – Daily inspection checklist thereafter	– Personnel will be trained in inspection checklist use
Fire extinguishers	– Monthly inspections will be performed – Annual re-certification will be performed	– Personnel will be given instructions on proper use of fire extinguishers
Spill control materials	– Daily safety inspection of spill control materials will be conducted	– Personnel will be given training on how to respond to spilled materials
Barge deck/working surfaces	– Daily inspections for oil/grease buildup will be conducted	– Requirements for house keeping will be reviewed
Tender boat engines	– Daily maintenance (fueling, oil, grease) will be conducted	– Operators/pilots will be trained in engine maintenance
Tender boats and skiffs	– Initial review/training prior to commencement of field activities	– Operators will be familiar with USGC regulations for watercraft – Personnel will have successfully completed the boating safety course – Float Plan submitted for each watercraft operation each day
Lighting/signaling systems	– Daily inspections will be made	– Operators will be trained in proper use of these safety systems
Cherry Picker	– Inspections will be performed on equipment prior to each use – Load and capacity calculations done prior to lift – Daily crane inspections and pre-lift checklist	– Qualified operators will be used for equipment operation – Document calculations, inspections, and checklist
Wind, weather instruments	– Annual calibration	– Site safety personnel will review equipment specifications and manufacturer’s documentation prior to using weather monitoring equipment

ACTIVITY HAZARD ANALYSIS

Site: TVA Kingston Ash Recovery Project
Activity: **Vibecore Sampling on Water**

Date of Analysis: 5/12/09

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Rigging	– Daily inspection for all rigging – Hoisting chains must have a documented inspection at least annually	– Personnel will be trained in proper rigging techniques and rigging inspection protocol

APPENDIX F
EMERGENCY RESPONSE AND CONTINGENCY PLAN

F1 – MAN OVERBOARD DRILL

All Captains will practice this procedure initially as a tabletop drill. Once the sequence and responsibilities are established an actual drill will be held on the water.

Be advised that in cold weather rescues, time is of the utmost importance.

When a person falls into the water – the first person to see him will maintain visual contact while alerting the ship's Captain to the person's location (if the person spotting the man overboard can maintain visual contact reach the nearest Type 4 PFD (life ring/cushion) and summon the Captain. The person spotting the man overboard will continually point out the location of the man overboard; if other personnel are available they will be summoned to help toss the life ring/cushion and notify the Captain. All work onboard the vessel will immediately cease when a "man overboard situation" exists.

The Captain will turn the screws (propellers) of the boat away from the location of the man overboard and will attempt to stay within 50 feet of the overboard person. The Captain will alert the Site Safety and Health Officer (SSHO) immediately, about the man overboard situation and keep the SSHO posted as to the person's condition as the rescue progresses. A man overboard may be a medical emergency and the SSHO/Emergency Coordinator may need to summon EMS to the dock/rally point or in extreme injury cases to the location of the boat (per the Site Safety and Health Plan Emergency Response and Contingency Plan).

Personnel tossing the life ring/cushion must remember to try to aim accurately for the person in the water so they only have to swim a minimum distance. Personnel tossing the life ring/cushion must also remember to secure the end of the rope so they can pull the overboard person back to the watercraft.

When personnel are retrieving the overboard individual they must remember that person will be heavy and may be a dead weight. Personnel will perform team lifting when available and will exercise caution so they are not also a man overboard.

Only as a last resort will other personnel jump into the water and these people will only do this if they have donned appropriate survival gear and have a second life ring/cushion that has a line secured to the watercraft.

Once the overboard person is rescued the boat will immediately proceed to the Emergency Evacuation Rally Point dock. Simultaneously the overboard person's condition will be monitored and the person will be treated for shock/hypothermia.

Upon arrival at the dock, the overboard person will immediately be transported to the paramedic station or the waiting ambulance.

FIGURE FII
PHONE TREE FOR EMERGENCY NOTIFICATION

Project Notification[1] – HSE Personnel to Call		
Name	**Organization**	**Number**
Steve McCracken	TVA – General Manager	423-413-1197
Jack Howard	Jacobs – Program Manager	865-399-7971
Danny Whitaker-Sheppard	Jacobs – HSE Manager	865-300-7441
Appropriate CM	Jacobs	
TVA Police	TVAP	800-824-3861 800-632-3631
Jacobs Construction Manager to Call		
Appropriate Jacobs Project Mgr.		
Michelle Cagley (If environmental)	TVA-Environmental	865-696-5038
SOS (If environmental or derailment)	TVA- Kingston Fossil Plant	865-717-2119
Jacobs HSE Manager to Call		
Kathryn Nash	TVA Program Manager	423-290-7820
Chuck Proffitt	TVA – Safety FGD&C	615-476-2327
Tom Heffernan	TVA – HSE	423-994-8582
TVA Sr. Manager	On weekend duty	See weekly board or email
Jacobs PM Personnel to Call		
Appropriate TVA TCM		
Katie Kline	TVA Community Outreach	865-621-8125
Barbara Scott	TDEC	865-230-1211
Medical Support Contacts		
Plant Nurse *(Mon – Thu; 0600 – 1600)*	TVA	865-717-2589
Paramedics *(7 days week; 24 hours per day)*	TVA	865-755-2556
TVA Police	TVA	800-824-3861
Fire Response Contacts		
Roane County Fire[2,3]	Roane County	911

Notes:

1. Provide initial medical care and initiate emergency control activities prior to making project notifications.
2. If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
3. TVA has a dedicated fire brigade for in-plant response. For activities occurring out on site, Roane County Fire (911) will provide primary response.

Figure FIII
Emergency Assembly Areas

FIV – WATER EXTRACTION POINT DESCRIPTIONS
(Listed from North to South)

Water Extraction Point (WEP) Number	Description	Address	Latitude	Longitude
WEP-01	Walnut Hill Boat Ramp. Between ERM 10 and 11.	325 Hickory Road Harriman, TN 37748	35N 56.635	84W 32.421
WEP-02	RSI boat ramp – ERM 3.	189 Lakeshore Drive Harriman, TN 37748	35N 55.017	84W 30.140
WE-03	Skimmer Wall at the Kingston Ash Recovery Site. Exclusion Zone entry required via VECP #2 off Swan Pond Road.	Enter Kingston Ash Recovery Site via Swan Pond Road VECP #2	35N 54.289	84W 30.217
WEP-04	Plant intake headwall near the filter plant. This area is outside of the designated Exclusion Zones.	Enter plant via primary emergency entrance	35N 54.041	84W 31.062
WEP-05	South dock at plant. This area is outside of the designated Exclusion Zones.	Enter plant via primary emergency entrance	35N 53.698	84W 31.355
WEP-06	Ladd's Landing boat ramp. Located offsite in a public area. Between CRM 4 and 5.	1477 N. Kentucky St. Kingston, TN 37763	35N 53.163	84W 29.518
WEP-07	Pier 58. Located offsite in a public area. Between CRM 0 and 1.	506 S. Kentucky St. Kingston, TN 37763	35N 52.031	84W 31.319
WEP-08	Caney Creek. Located offsite in a public area. Between TRM-562 and 563.	835 Caney Creek Rd. Harriman, TN 37748	35N 51.336	84W 36.033
WEP-09	Blue Springs Marina. Located offsite in public area. Between TRM 547 and 548.	3952 River Road Ten Mile, TN 37880	35N 44.095	84W 40.058

Notes:

CRM = Clinch River Mile
ERM = Emory River Mile
TRM = Tennessee River Mile
VECP = vehicle entry control point

Figure FIVa KIF Access Locations

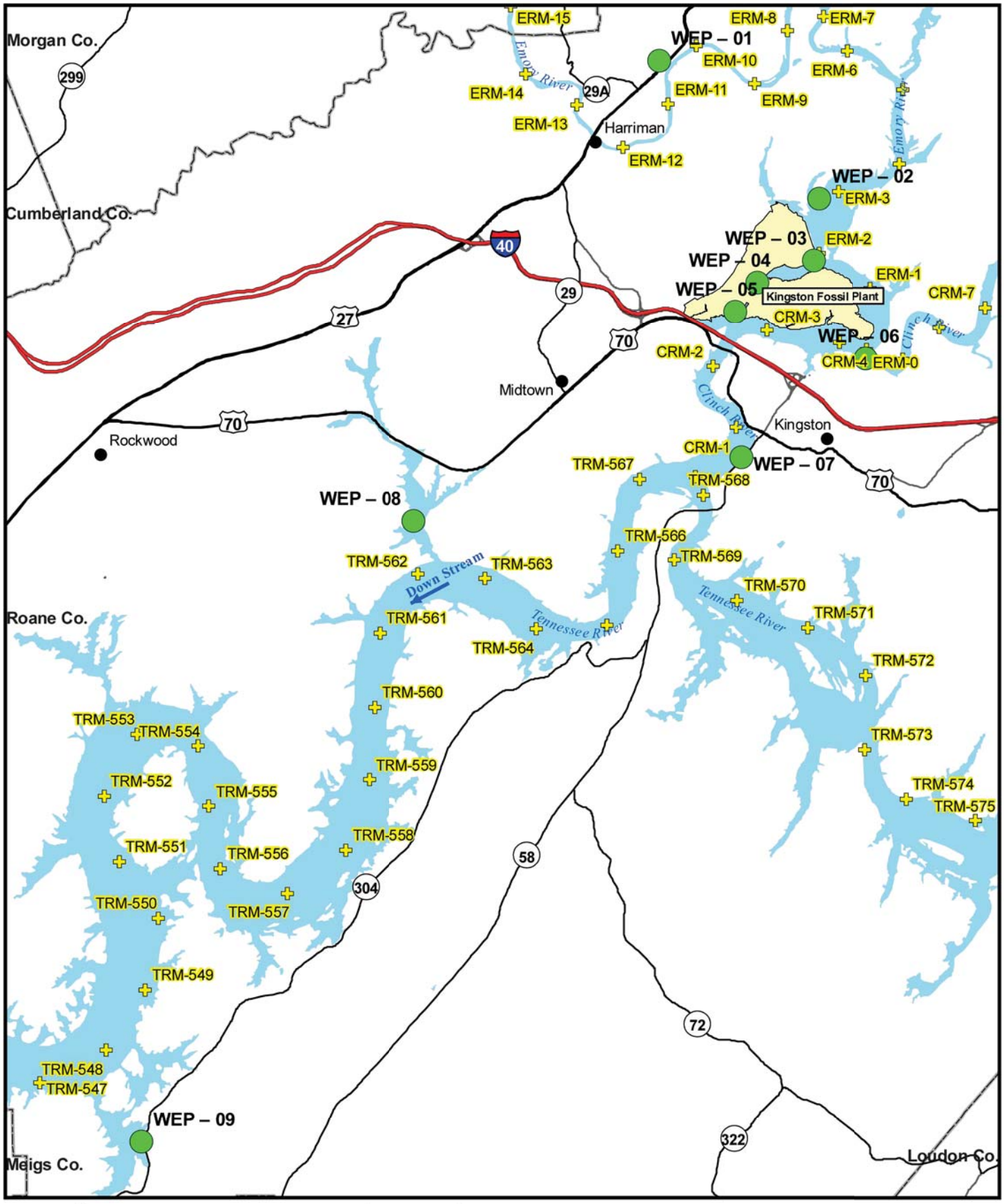
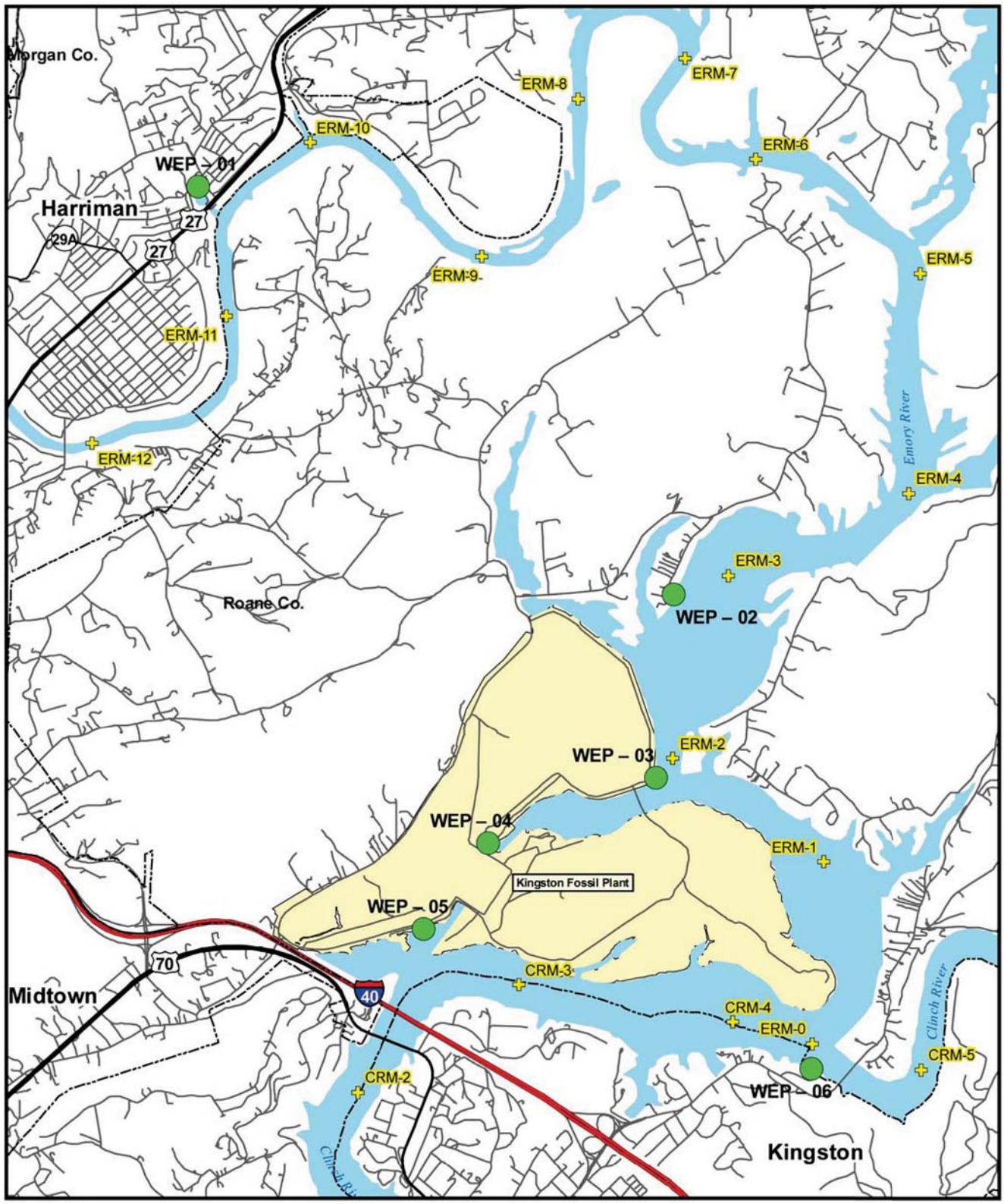


Figure FIVb KIF Access Locations



Legend

Boat Access Site

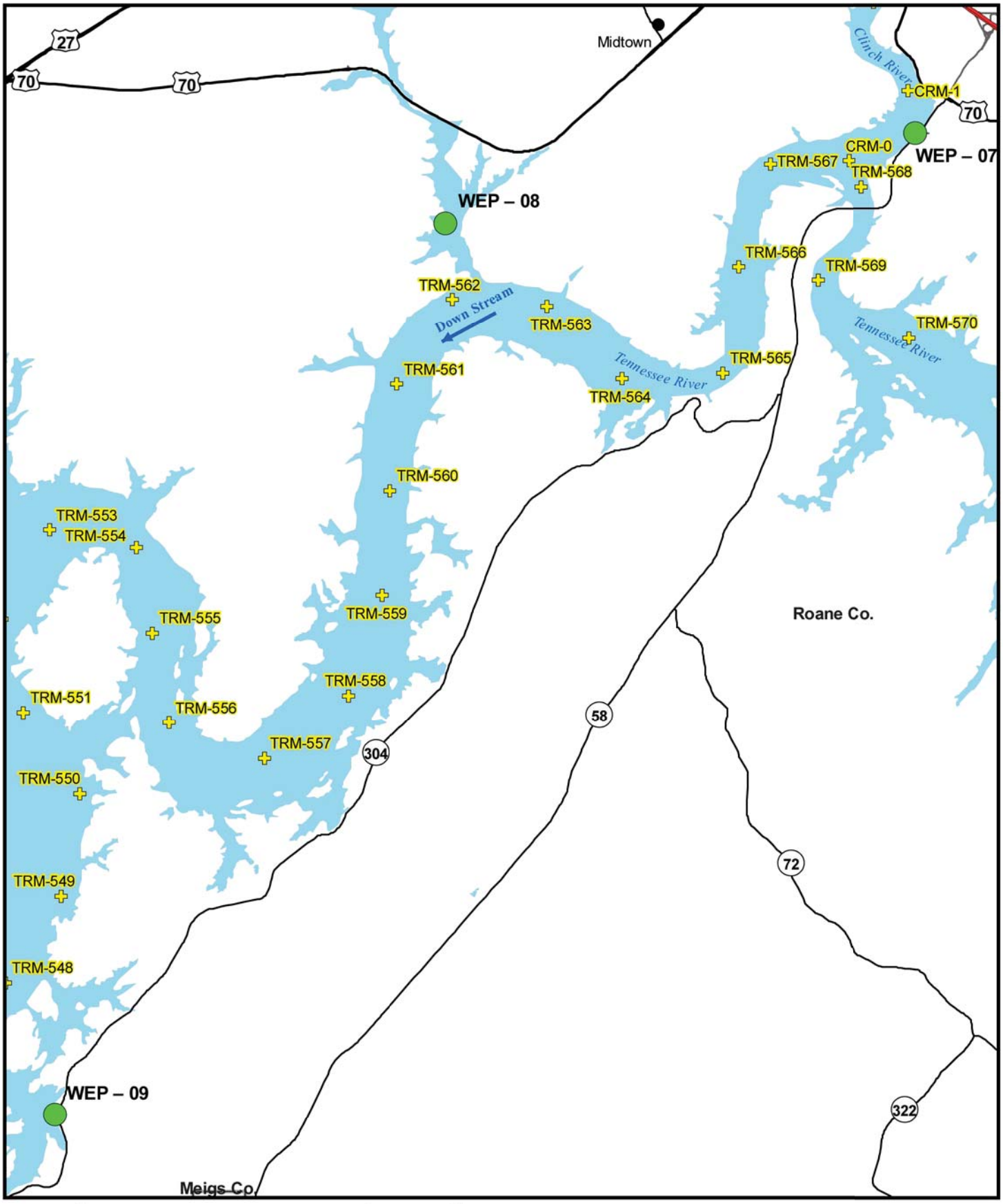
Map Compiled: 09/02/2009

0 1 2 3 Miles

Tennessee Valley Authority
OE&R - ER&S
Geographic Information & Engineering

Map Filename: Boat_Access_Sites_20090831_8x11.mxd

Figure FIVc KIF Access Locations



Legend

Boat Access Site

N

0 1 2 3 Miles

Map Compiled: 09/02/2009

Map Filename: Boat_Access_Sites_20090831_8x11.mxd

Tennessee Valley Authority
OE&R - ER&S
Geographic Information & Engineering

Figure FV
Emergency Chemical Shelters

N

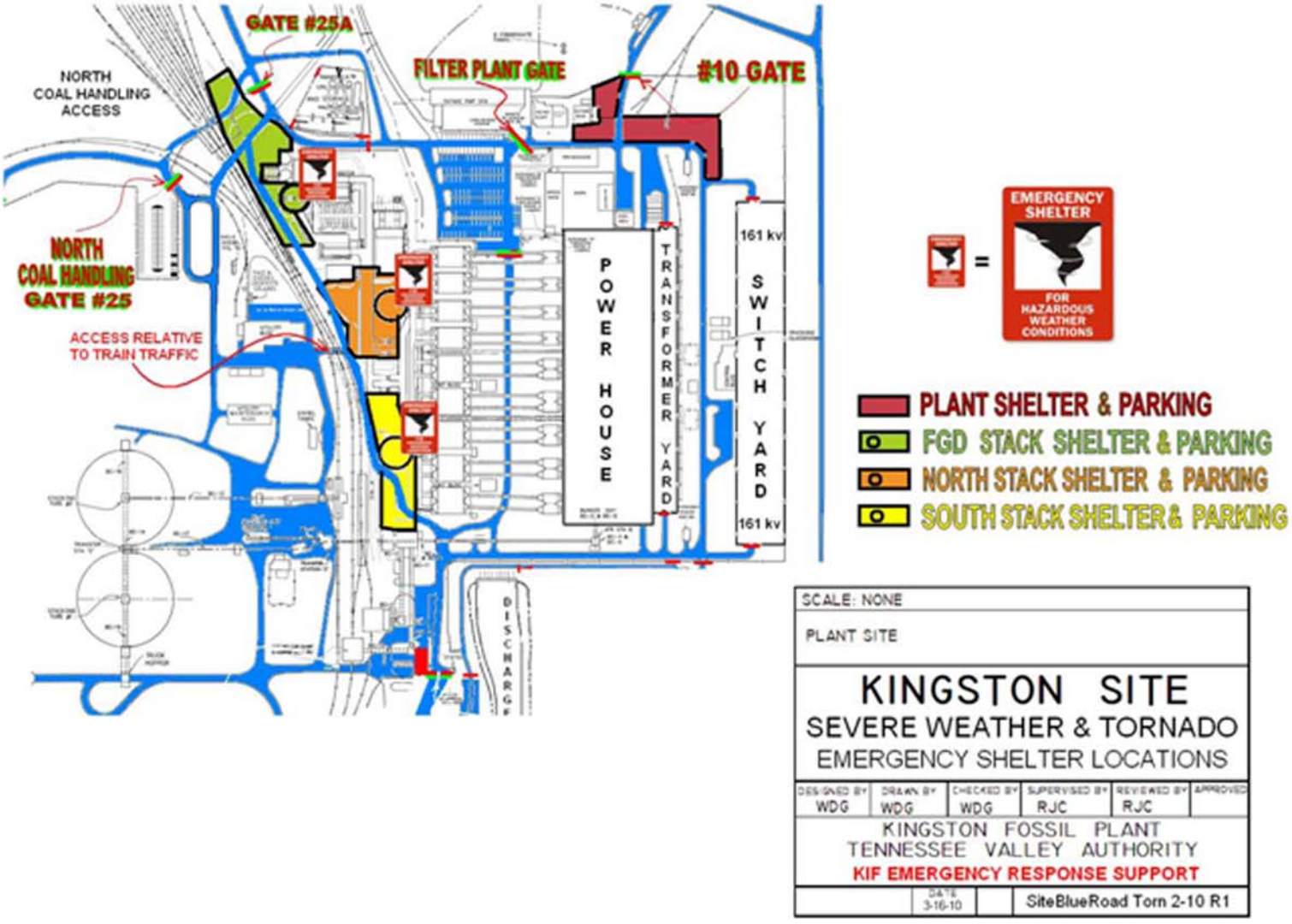
0 630 1,260 1,890 2,520
Feet

Date of Photography : 04/09/2009

Tennessee Valley Authority
CEMR - DRAS
Geographic Information & Engineering


ASH RECOVERY SITE EMERGENCY
1. Call 911 or 865-354-8045
2. Declare a medical emergency on site radio channel 1 and request assistance to your location.
3. Call TVA Police (800-824-3861) for medical escort assistance or send a runner.
4. Call Site Paramedics (865-755-2556)
5. Ensure the area is safe and provide care if trained.
Emergency Response Evacuation Points
1. Trailer City
2. Material Access Point
3. South Entry (Decon)
4. North Embayment
5. James Garage
6. RSI House
119
145
179
East Embayment
Lakeshore Dr
AED RSI Sample House 189 Lakeshore Dr
6. RSI House
AED Berkshire House
4. North Embayment
5. James Garage
James Loop
T2 Dike
East of T2 Dike
RB
Berkshire
Berkshire Slew
Swan Pond Circle Rd
Swan Pond Rd
Circle Rd
North of East West Haul Rd
MAP Trailer
2. Material Access Point
East West Haul Rd
C Dike
Lateral Expansion
Dredge Cell
D Dike
Intermediate Dike
Dike
Skimmer Wall
Ash Pond
Swan Pond Rd
AED AT-3 Trailer
GUARD PORTAL
AMBULANCE NORTH SECTOR ACCESS
ACCESS RELATIVE TO TRAIN TRAFFIC
1. Trailer City
Medic Trailer
Ash Track 1
Ash Track 3
Dragline Road
3. South Entry (Decon)
FILTER PLANT GATE
AED Locations =
Rescue Board = RB
EMERGENCY SHELTER FOR HAZARDOUS WEATHER CONDITIONS
SITE EMERGENCY CONTACT 717-2141 (EL CTRL BLDG OPERATOR)
SCALE: NONE
PLANT SITE
KINGSTON SITE
ASH RECOVERY
DESIGNED BY WDG
DRAWN BY WDG
CHECKED BY WDG
SUPERVISED BY RJC
REVIEWED BY RJC
APPROVED
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
EMERGENCY RESPONSE SUPPORT
DATE 8/23/10
Recov 8-25-10

Figure VIb Severe Weather Shelters



SCALE: NONE

PLANT SITE

KINGSTON SITE

SEVERE WEATHER & TORNADO EMERGENCY SHELTER LOCATIONS

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED
WDG	WDG	WDG	RJC	RJC	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
KIF EMERGENCY RESPONSE SUPPORT

	DATE		
	3-16-10		SiteBlueRoad Torn 2-10 R1

FVII – SEVERE WEATHER PROCEDURES

SPECIAL MARINE CONSIDERATIONS

Gale Force Winds (34 to 47 knots or 39 to 54 mph)

No field work is to proceed during gale forced wind events. In addition, all areas will cease work a minimum of 30 minutes before the storm arrives. Any specific equipment or high-risk equipment (i.e., cranes, derricks) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the Activity Hazard Analysis. All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked or removed from the water.

Use of any 12 to 16 foot aluminum-hulled tender boat during small craft advisories or greater warnings (18 to 33 knots or 20 to 38 mph) will not be allowed.

River Velocities

When Emory River flows reach 5,000 cubic feet per second (cfs) at the U.S. Coast Guard (USGS) station at Oakdale, Tennessee, site crews conducting river operations shall perform an evaluation of the specific river conditions at their work location, size of craft or vessel being used, and operational/task requirements to determine if safe conditions exist to continue operations.

When river flows reach 10,000 cfs at the USGS station at Oakdale, only emergency river operations related to rescue are permitted. All other personnel shall be restricted from river access.

Fog/Heavy Rain

If visibility is decreased to less than 10 feet, all boat movement must stop with the exception of emergency situations. During boat operations in fog/heavy rain with visibility greater than 10 feet, operation speed must be maintained to an appropriate level given the amount of visibility.

Should it be determined by the TVA/Jacobs personnel and the Captain that the weather conditions being encountered on the watercraft are dangerous and are worsening, all operations will cease, all equipment will be lashed to the deck or placed in the storage area, and all personnel will be transported to shore.

GENERAL MARINE CONSIDERATIONS

All vessels and personnel will maintain radio and cellular telephone communications/contact with the field offices. Radio communication/contact will occur via the site UHF radios and VHF marine radios. The channels to be used must be coordinated in advance and noted on the task-specific SWP.

National Weather Service (NWS) local weather forecasts will be monitored daily by Jacobs and contractor personnel for predicted inclement weather. Local weather forecasts will be discussed at the daily health and safety meeting.

All on-water personnel shall be aware of the forecast and keep an “eye to the sky”. Unpredicted storms may also occur without warning. The SSHO will also monitor NWS local Doppler radar as required and vessel Captains will monitor marine forecasts on the NWS radio frequencies.

FVIII – MARINE EMERGENCY EQUIPMENT

1.0 GENERAL EQUIPMENT REQUIREMENTS

1.1 Fire

All watercraft having gasoline or liquid petroleum gas power plants or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic carbon dioxide or other equally effective type of fire extinguishing system.

Each watercraft shall carry fire extinguishers (for use in gasoline, oil, and grease fires) approved by Underwriters Laboratories. Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately. Extinguisher requirements are summarized in Table FVIII-1.

Table FVIII-1: Extinguisher Requirements

Length of Watercraft	Extinguisher Type	Minimum Number Required
26 feet or less	1-A:10-B:C	1
26 feet or more	1-A:10-B:C	2

1.2 Alarms Emergency Signaling Devices

General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person. Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, which will automatically furnish the required energy during an electrical system failure.

A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck. All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck. All watercraft shall carry at least one air horn or similar sound-signaling device.

All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them. Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light. No single signaling device is ideal under all conditions and for all purposes.

Smoke and carbon monoxide alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.

1.3 Emergency Tools, Controls and Equipment

Vessels which do not have an enclosed operator control area or adequate railings require a dead-man switch be attached to the boat operator in the event they are ejected from the boat while it is in motion.

All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc.). The tool kit shall be maintained by the watercraft operator, and expended supplies shall be replaced immediately.

Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.

All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems - shall be located so that they are protected against accidental operation but are readily accessible in an emergency.

Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.

A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 6 feet (1.8 m) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.

A shutoff valve shall be installed at the fuel tank connection; arrangements shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.

1.4 Emergency Escape

All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

Escape hatches and emergency exits shall be marked on both sides with letters, at least 1 inch (2.5 cm) high, stating “EMERGENCY EXIT - KEEP CLEAR.”

Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.

1.5 Fuel, Oil, and Lubricants

Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with Naval Facilities Command DM-22, Petroleum Fuel Facilities. In lieu of a dike or curb, other means complying with U.S. Coast Guard (USCG) requirements in 46 CFR Parts 64, Marine Portable Tanks, and 98.30, Handling and Storage of Portable Tanks, may be used.

Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For un-inspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

2.0 LIFESAVING SKIFFS

At least one lifesaving skiff (a powered johnboat or other smaller boat used in emergencies) shall be immediately available at locations where employees are working over or adjacent to water (based on an assessment by the Site Safety and Health Officer [SSHO]).

2.1 Readiness Requirements

It is not required to have a single dedicated boat or operator standing by for emergency rescue, however a lifesaving skiff must be “immediately available”.

The Occupational Safety and Health Administration (OSHA) has established the following criteria for determining when a lifesaving skiff is to be considered as being immediately available:

- The skiff must be in the water or capable of being quickly launched by one person.
- Personnel trained in launching and operating the skiff shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill before the initiation of work at the site and periodically thereafter as specified by the SSHO.
- When the operator is on break another operator must be designated to provide the requisite coverage while employees are above water.
- The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.
- The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff and get underway.
- The communication system, such as a two-way radio, must be used to inform the skiff operator of an emergency and to inform the operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars as a secondary means of propulsion.

2.2 Equipment Requirements

Those craft which are recognized as lifesaving skiffs are required to be maintained as such which include the following equipment:

- Spotlight for night operations.
- Four oars (two if the skiff is motor powered).
- Oarlocks attached to gunwales or the oars.
- One ball-pointed boat hook.
- One life ring with at least 70 feet (21 meters) of 3/8 (1 centimeter) solid braid polypropylene line, or equivalent, attached.
- Personal flotation devices (PFD) in number equaling the skiff rating for the maximum number of personnel allowed on board.
- In locations where waters are rough, swift, or where manually operated boats are not practical, a powerboat suitable for the waters shall be provided and equipped for lifesaving.
- Skiffs shall have flotation tanks or buoyant material capable of floating the boat and its equipment and the crew.
- On vessels (e.g., skiffs) without permanently mounted navigation lights, portable battery-operated navigation lights will be available and used for night operations.

- According to OSHA's directive relative to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

  - The number of work locations where there is a danger of falling into water;
  - The distance to each of those locations;
  - Water temperature;
  - Currents; and
  - Other hazards such as, but not limited to, rapids, dams, and water intakes.

In addition to the preceding, the employer is required to comply with all other applicable standards including, but not limited to, the requirement that the injured employee is promptly treated by medical personnel or an employee certified in First Aid. This could mean that medical treatment might have to begin in the lifesaving skiff.

3.0 FLOTATION DEVICES

3.1 Personal

A USCG-approved PFD shall be provided to and properly worn by all persons in the following circumstances:

- On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc.
- On structures extending over or next to water.
- Any work on or within 6 feet of the water where falling into the water is a potential hazard.
- Working alone at night where there are drowning hazards, regardless of other safeguards provided.
- Wherever there is a drowning hazard.
- PFDs are required for all marine work.

3.2 Life Rings – Watercraft

- Each watercraft shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water, and grasped and held by the user until rescued. A life ring or horseshoe buoy are two common examples of a Type IV PFD.
- All Type IV PFDs must be approved by the SSHO prior to use. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached. Throw bags may be used in addition to life rings or ring buoys.
- Life rings or ring buoys shall be readily available and shall be provided as follows:

  - A minimum of one on each vessel.
  - A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats 40 feet (12 meters) in length or longer.
  - A minimum of two on any other piece or group of floating plant up to 100 feet (30 meters) in length and one additional for each increase in length of 100 feet (30 meters) or fraction thereof.

3.3 Life Rings – Shoreline Locations

One life rings (Type IV PFD) with at least 90 feet of line, shall be provided and readily available for emergency rescue operations at intervals of not more than 200 feet (60 meters).

Examples of applicable locations include floating pipelines, walkways, wharves, piers, bulkheads, scaffolds, platforms, and similar structures extending over or immediately next to water. Table FVIII-2 lists the requirements for emergencies, spills, and discharges.

Table FVIII-2: Required Emergency, Spill, and Discharge Control Equipment and Materials

Equipment	Location
Communications	
Telephone – hardwire	Individual office trailers
Telephone – cellular	Key personnel
Two-way radios (marine)	With key site personnel
Horn	Each work crew and office
Binoculars	Health and safety office
Monitoring Equipment	
Air monitoring equipment (i.e., PID, etc.)	Health and safety office
Explosimeter/oxygen meter	Health and safety office
Dust monitor	Health and safety office
Personal Protective Equipment	
Personal floatation device	Watercraft, shoreline locations
Ring buoys with ropes	All watercraft, shoreline locations
Spill Response Equipment	
Fire extinguisher	Trailers, boats, vehicles, heavy equipment, active work zones
Turbidity curtain and absorbent boom	Deployed around specific on-water work areas
Absorbent booms and pads	Storage trailer/barges
Shovels, brooms, and squeegees	Storage trailer
Pressure washer	Storage trailer
Empty drums	Adjacent to storage trailer
First Aid	
First Aid kits	Various – trailers and work areas
Blankets	Storage trailer
Emergency eye wash	Work areas where chemicals are present, fueling stations
Dust Control	
Source of clean water	Work areas
Spray equipment	Work areas

APPENDIX G
TRAINING MATRIX

Appendix A

Health and Safety Training Course Matrix

Procedure Number	Course Title	ATIS Number	Frequency	Duration
402	Accident Investigation for Supervisors	00059100	Initial	2 hours
403	Aerial Lifts	00059101	Initial / 3 years	4 hours
404	All Terrain Vehicle (ATV) Safety	00059102	Initial	1 hour
405	Ammonia Awareness	00059103	Initial	1 hour
406	Boating Safety	00059104	Initial	3 hours
407	Chain Saw Safety Chain Saw Safety Refresher	00059105 00059106	Initial 2 years	32 hours 4 hours
408	Chemical Cleaning of Boilers	00059107	Initial / Annual	½ hour
409	Chemical Hygiene Orientation	00059108	Initial	2 ½ hours
410	Confined Space Entry	00059109	Initial / 5 years	3 hours
410	Confined Space Test Instruments	00059159	Initial / 5 Years	2 hours
411	Crane Safety (Mobile)	00059110	Initial / 3 years	24 hours
412	Crane Safety (Overhead)	00059111	Initial / 5 years	8 hours
413	Crane Safety (Pendant)	00059112	Initial / 3 years	1 hour
414	Defensive Driving	00059113	Initial	6 hours
415	Arc Flash Hazard Calculation & Required Protection	00059114	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional)	00059192	Initial	½ hour
416	Electrical Safety per OSHA 1910.269	00059115	Initial	2 hours
417	General Employee Safety Orientation Note: This course standard was titled Employee Safety Orientation, ATIS Number 00059116. The course has been revised to include employee safety orientation and personal protective equipment. See also 441	00059164	Initial	2 hours
418	Ergonomics	00059117	Initial	3 hours
419	Excavating & Trenching (Affected Person)	00059118	Initial	1 hour
420	Excavating & Trenching (Competent Person)	00059119	Initial	4 hours
421	Fall Protection Systems	00059120	Initial	1 ½ hours
422	Flagging Motor Vehicle Traffic	00059121	Initial	1 hour
423	Forklift Operations	00059122	Initial / 3 years	4 hours
424	Grounding Safety Procedures INACTIVE This course has been replaced by Temporary Protective Grounding for Generating Stations 00059213	00059123	Initial	4 hours
424	Grounding Safety Procedures - Refresher	00059189	Annual	2 hours
425	Hand & Portable Power Tools	00059124	Initial	1 hour
426	Handling & Storage of Compressed Gases / Flammable / Combustible Liquids	00059125	Initial	1 hour
427	Hazard Communication	00059126	Initial	2 hours
428	Hazard Recognition and Control	00059127	Initial	1 hour
429	Health & Safety Committee	00059128	Initial	1 hour

Procedure Number	Course Title	ATIS Number	Frequency	Duration
430	Hearing Conservation	00059129	Initial / Annual	½ hour
431	Heat Stress	00059130	Initial	1 hour
431	Heat Stress Monitor (IST Sensor Lynx)	00056163	Initial	1 hour
431	Heat Stress Monitor (Metrosonics hs-32)	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214)	00059187	Initial	1 hour
432	Herbicide / Pesticide Applicator	00059131	Initial	1 hour
433	Inorganic Arsenic	00059132	Initial / Annual	2 ½ hours
434	Inorganic Lead	00059133	Initial / Annual	2 ½ hours
435	Interlocking Safety Audits (INACTIVE) Replaced by Safety Coaching Visits	00059134	Initial	1 ½ hours
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
436	Job Safety Analysis	00059135	Initial	3 hours
437	Ladder Safety	00059136	Initial	1 hour
438	Lockout / Tagout (FM)	00059137	Initial	2 hours
439	Machine & Equipment Safety	00059138	Initial	1 hour
440	Mercury Awareness	00059139	Initial	1 hour
441	Personal Protective Equipment See TVA Safety Procedure 417	00059140	Initial	2 hours
442	Powder Actuated Tools	00059141	Initial	1 hour
443	Radiation Boundary	00059142	Initial	1 hour
444	Radio Frequency (RF) and EMF	00059143	Initial	½ hour
445	Railroad Safety	00059144	Initial	2 hours
446	Refractory Ceramic Fibers	00059145	Initial	2 hours
447	Respiratory Protection (Non-Nuclear)	00059146	Initial / Annual	2 hours
448	Safe Rigging Principles and Requirements	00059147	Initial	16 hours
449	Rivers and Decks Skills Rivers and Decks Skills Refresher	00059148 00059149	Initial Annual	24 hours 3 hours
450	Scaffolds (Built-up & Suspended)	00059150	Initial	2 hours
451	Supervisory Safety Orientation	00059151	Initial	3 hours
452	Introduction to the TVA Safety Manual	00059152	Initial	½ hour
453	How to Use the TVA Safety Manual	00059153	Initial	½ hour
Appendix B	Block Safety Training for Supervisors (Option A) **Deleted - No Longer Available as Block Training**	00059154	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option A) **Deleted - No Longer Available as Block Training**	00059155	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option B) **Deleted - No Longer Available as Block Training**	00059156	As needed	4 hours
Appendix B	Block Safety Training for Employees (Option C) **Deleted - No Longer Available as Block Training**	00059157	As needed	24 hours
Appendix B	Block Safety Training for Employees (Option D) **Deleted - No Longer Available as Block Training**	00059158	As needed	16 hours
410	Confined Space Test Instruments see also at 410	00059159	Initial / 5 Years	2 hours
454	Serious Accident Investigation	00059160	Initial	8 hours
Appendix B	Block Safety Training for Employees (Option E) **Deleted - No Longer Available as Block Training**	00059161	As needed	4 hours

Procedure Number	Course Title	ATIS Number	Frequency	Duration
Appendix B	Block Safety Training for Employees (Option F) **Deleted - No Longer Available as Block Training**	00059162	As needed	8 hours
431	Heat Stress Monitor (IST Sensor Lynx) see also at 431	00059163	Initial	1 hour
455	OSHA Construction Safety Training	00059165	Initial	10 hours
	OSHA General Industry Safety Training	00059166	Initial	10 hours
411	0-20 Ton Hydraulic Telescoping Boom Crane	00059167	Initial / 3 years	Skills
411	21-90 Ton Hydraulic Telescoping Boom Crane	00059168	Initial / 3 years	Skills
411	91 Ton & Larger Hydraulic Telescoping Boom Crane	00059169	Initial / 3 years	Skills
411	Crawler Mounted Hydraulic Crane	00059170	Initial / 3 years	Skills
411	Commercial Truck Mounted Hydraulic Crane	00059171	Initial / 3 years	Skills
411	Articulating Boom Hydraulic Crane	00059172	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane	00059173	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane with Tower Attachment	00059174	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane	00059175	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane	00059176	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Tower Attachment	00059177	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Tower Attachment	00059178	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Ringer Attachment	00059179	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Ringer Attachment	00059180	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Luffer Attachment	00059181	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Luffer Attachment	00059182	Initial / 3 years	Skills
411	Mobile Crane Field Coordinator	00059183	Initial / 3 years	Skills
411	Mobile Crane Skills Evaluator	00059184	Initial / 3 years	Skills
411	Mobile Crane Annual Inspector	00059185	Initial / 3 years	Skills
431	Heat Stress Monitor (Metrosonics hs-32) see also at 431	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214) see also at 431	00059187	Initial	1 hour
456	Formaldehyde Awareness	00059188	Initial / Annual	½ hour
424	Grounding Safety Procedures – Refresher see also at 424	00059189	Annual	2 hours
	Plan Jobs Safely	00059190	Initial	3 hours
457	Recording, Reporting and Classifying Occupational Injuries and Illnesses	00059191	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional) see also at 415	00059192	Initial	1 hour
458	Safety Orientation for Staff Augmented Contractors	00059193	Initial	1 hour
459	Clearance Procedure (Responsible / Qualified Employee)	00059194	Initial / Annual	8 hours
459	Clearance Procedure (Primary Authorized Employee)	00059195	Initial / Annual	4 hours
459	Clearance Procedure (Authorized Employee)	00059196	Initial / Annual	1 hour
	High Hazard Lifts	00059197	Initial	1 hour

Appendix B	Block Safety Training for Employees (Option G)	00059198	As needed	4 hours
Procedure Number	**Course Title**	**ATIS Number**	**Frequency**	**Duration**
459	Clearance Procedure (Affected Employee)	00059199	Initial / Annual	1 hour
403	Articulating Boom Aerial Lift Platforms	00059200	Initial / 3 years	Skills
403	Extendable / Telescoping Boom Aerial Platforms	00059201	Initial / 3 years	Skills
403	Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	00059202	Initial / 3 years	Skills
403	Scissor Lifts	00059203	Initial / 3 years	Skills
403	Insulated Aerial Devices	00059204	Initial / 3 years	Skills
460	Hexavalent Chromium	00059205	Initial / Annual	2 hours
461	Equipotential Grounding	00059206	Initial	5 hours
424	Placing & Removing Grounds in 4160 & 6900 Volt Cubicles	00059207	Initial	Skills
424	Placing & Removing Grounds on Hydroelectric & Combustion Turbines	00059208	Initial	Skills
461	Equipotential Grounding - Refresher	00059209	Initial / 2 years	4 hours
424	Placing & Removing Temporary Protective Grounding Devices in 4160 & 6900 Cubicles	00059210	Initial	Skills
424	Placing & Removing Protective Grounds on Hydro Plant Main Transformers	00059211	Initial	Skills
461	Transmission Line Equipotential Work Zone	00059212	Initial / 2 years	Skills
424	Temporary Protective Grounding for Generating Stations	00059213	Initial	4 hours
407	Chain Saw Safety	00059214		
448	Rigging Lab	00059215	Optional	8 hours
461	Placing and Removing Protective Grounds on Substation Breaker	00059216		Skills
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
448	Safe Rigging Principles and Requirements Refresher	00059218	Annual	4 hours
448	Advanced Rigger Training	00059219	Initial	

APPENDIX H
MARINE OPERATION REQUIREMENTS

MARINE OPERATION REQUIREMENTS
TVA FLY ASH DREDGE AND ON-WATER ACTIVITIES

1 FLOAT PLAN

1.1 Completed every day before going boating.

1.2 File with company Point of Contact (POC) on land.

1.3 Means of communication between boat and POC.

1.4 Keep copies in HSE records.

2 WATERCRAFT OPERATIONS

2.1 The sections of water we will be working are under jurisdiction of the U.S. Coast Guard (USCG). As such, all equipment and operating personnel will meet or exceed USCG requirements for safety equipment.

2.2 Issue a Notice to Mariners to USCG Marine Safety Office.

2.3 Operators demonstrate they are experienced and knowledgeable in operating watercraft or will be required to complete the TVA Boating Safety course ATIS Number 00059104 or demonstrate equivalent knowledge.

2.4 Pilots license may be required depending on craft operated.

3 WEATHER CONDITIONS

3.1 Evaluate weather before venturing out on boat. The following weather conditions may be encountered:

3.1.1 Gale Force Winds (34 to 47 knots or 39 to 54 mph) – No field work is to proceed during gale forced wind events. In addition, all areas will cease work a minimum of one half-hour before the storm arrives. Any specific equipment or high-risk equipment (i.e., cranes, derricks) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the Activity Hazard Analysis (AHA). All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked or removed from the water.

3.1.2 High Winds – Use of any 12 to 16 foot aluminum-hulled tender boat during small craft advisories or greater warnings (18 to 33 knots or 20 to 38 mph) will not be allowed.

3.1.3 River Velocities – When Emory River flows reach 5,000 cubic feet per second at the USGS station at Oakdale, TN, site crews conducting river operations shall perform an evaluation of the specific river conditions at their work location, size of craft or vessel being used, and operational/task requirements to determine if safe conditions exist to continue operations. When river flows reach 10,000 cubic feet per second at the USGS station at Oakdale, only emergency river operations related to rescue are permitted. All other personnel shall be restricted from river access.

3.1.4 Fog / Heavy Rain – If visibility is decreased to less than 10 feet, all boat movement must stop with the exception of emergency situations. During boat operations in fog / heavy rain with visibility greater than 10 feet, operation speed must be maintained to an appropriate level given the amount of visibility.

3.2 Vessels to be available to tow stranded vessels against current and winds.

3.3 Cold Water Operations.

3.3.1 Due to decreased water and air temperatures and the recommendations of USCG, a minimum of flotation coveralls or flotation bibs / jackets are required for all high risk employees working on the water during the winter months (December thru March) or when water temperatures are below 50 degrees Fahrenheit.

3.3.2 High risk refers to the risk of going overboard combined with likelihood of extended periods of time in exposure conditions, either in or out of the water. This can be attributed to a number of factors including likelihood of being rescued promptly and proximity to shelter or medical treatment upon exiting the water.

3.3.3 Examples of high risk groups include:

- Sample personnel
- On-water surveying personnel
- Night shift deckhands
- Personnel operating watercraft alone

3.3.4 Cold water survival gear is encouraged for all other personnel working on the water during winter months.

3.3.5 Means for emergency contact that is reliable for water-based activities must be maintained by all personnel that perform activities physically separate from the main site. The means of communication must facilitate cold water rescue activities and ensure prompt aid for those potentially suffering from hypothermia.

3.3.6 In the instance that cell phones are intended to be used for emergency communication of high risk crews, they must maintain the phones on their person and be protected from submersion.

4 EMERGENCY RESPONSE

4.1 See Emergency Response and Contingency Plan.

4.2 Rescue drills or man overboard drills to be completed per the guidance outlined in Appendix F, Document F1 – Man Overboard Drill.

5 SAFETY RULES

5.1 All barges and floating watercraft moored overnight must display lighting and be sufficiently illuminated.

5.2 Vessels expected to function in emergency response must be equipped with at least one spotlight.

5.3 Cables and lines that cross waterways must be clearly marked.

5.4 All watercraft to carry at least one air horn or similar sound signaling device.

5.5 All watercraft are to carry fire extinguishers. Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by the Underwriters Laboratories. Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.

5.5.1 Requirements per boat length:

- 26 feet or more in length = 2 extinguishers
- < 26 feet = 1 extinguisher

5.5.2 All watercraft having gasoline or liquid petroleum gas power plants, or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic CO_2 or other equally effective type of fire extinguishing system.

5.6 Personal Flotation Devices (PFD):

5.6.1 USCG-approved PFD are to be provided and properly worn by each person onboard.

5.6.2 Type I, III, or V PFDs shall be worn. Most Type III and V are not as effective as Type I in turning an unconscious wearer face-up, but are less bulky and restrictive.

5.6.3 See Attachment H-1 for Type V inspection and testing frequency.

5.7 Life rings with at least 90 feet or line shall be provided and available at an interval of not more than 200 feet immediately next to water.

6 PIPELINE

6.1 Pipeline both submerged and floating is to be marked as such, along entire length.

7 LIFESAVING SKIFF

7.1 At least one lifesaving skiff (powered john boat or other smaller boat) shall be immediately available where employees are working adjacent to water. Required equipment for rescue skiff:

7.1.1 Four oars (two if skiff is motor powered).

7.1.2 Oarlocks attached to gun-whales.

7.1.3 One ball-pointed ball hook.

7.1.4 One life ring with at least 70 feet of solid braid polypropylene line.

7.1.5 PFDs in number equaling the maximum number of personnel on board.

7.1.6 Lighting on skiff.

8 STANDING UP

8.1 Employees should not stand up in boat when starting the motor. In boats 16 feet or less, occupants should not stand up or move around when boat is underway.

9 SECONDARY MEANS OF PROPULSION

9.1 Always carry a secondary means of propulsion.

10 TWO-MAN RULE

10.1 At least two people are required to be in the boat when on open water. Two people are also required for boating activities occurring from sundown to sunrise.

10.2 Any exceptions to the two-man rule require approval from the immediate supervisor. Restrictions, controls and means of effective communication must be addressed in the related AHA.

11 PERMITS

11.1 For dock work, hot work permits are needed for all open flame and welding activities.

12 EQUIPMENT REQUIREMENTS

12.1 All watercraft shall carry at least one air horn or similar sound-signaling device.

12.2 Rescue vessels to be used at night must be equipped with an adequate spotlight

12.3 Each vessel used outside of the closed section of river must carry laminated maps and descriptions of designated emergency water extraction points

12.4 Each watercraft operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise.

12.5 Navigational lighting shall be in compliance with USCG and the U.S. Army Corps of Engineers requirements.

12.6 Watercraft shall be operated at reduced speeds at night and when visibility is reduced.

12.7 All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals.

12.7.1 Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares.

12.7.2 Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light.

12.7.3 No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.

12.8 All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc.). The tool kit shall be maintained by the watercraft operator and expended supplies shall be replaced immediately.

12.9 Fenders shall be provided to prevent damage and sparking and to provide safe areas for workers exposed to pinching situations caused by floating equipment.

12.10 Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.

12.11 A signal device shall be provided on all vessels to give signals required by the navigation rules applicable to the waters on which the vessel is operated.

12.12 All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems shall be located so that they are protected against accidental operation but are readily accessible in an emergency.

12.13 Electric lights used on or around gasoline and oil barges or other marine locations where a fire or explosion hazard exists shall be explosion-proof.

12.14 General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person.

12.14.1 Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, that will automatically furnish the required energy during an electrical system failure.

12.14.2 A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck.

12.14.3 All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.

12.15 Smoke alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.

12.16 All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

12.17 Escape hatches and emergency exits shall be marked on both sides with letters, at least 1-inch (2.5 cm) high, stating “EMERGENCY EXIT - KEEP CLEAR.”

12.18 Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.

12.19 Shore power receptacles shall have a grounding conductor to prevent potential difference between the shore and the vessel.

12.20 Circuits with GFCI protection shall be provided in grounded 120 or 240 volt systems in toilet/shower spaces, galley, machinery spaces, weather deck, exterior, or near any sinks.

12.21 Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.

12.22 Gauge glasses or try cocks shall not be installed on fuel tanks or lines unless they meet the requirements of 46 CFR 58.50-10.

12.23 A shutoff valve shall be installed at the fuel tank connection: arrangement shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.

12.24 A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 6 feet (1.8 m) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.

12.25 All carburetors on gasoline engines shall be equipped with a backfire trap or flame arrestor.

12.26 All carburetors except down draft type shall be provided with a drip pan, with flame screen, which is continuously emptied by suction from the intake manifold or by a waste tank.

12.27 Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with NAVFAC DM-22, *Petroleum Fuel Facilities*. In lieu of a dike or curb, other means complying with USCG requirements in 46 CFR Parts 64, *Marine Portable Tanks* and 98.30, *Handling and Storage of Portable Tanks*, may be used.

12.28 Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For uninspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

ATTACHMENT H-1
Type V Personal Flotation Device Inspection and Testing Frequency [1]

1. Inspect before each use:

    a. Inflation Mechanism Status Indicators
    b. CO_2 cylinder cap

2. Inspect at beginning of each season and every 2 months afterwards during use:

    a. Inflatable chamber for leaks
    b. PFD for rips, tears, and puncture
    c. CO_2 cylinder for damage

3. Inspect at beginning of every season:

    a. Automatic Inflation system
    b. Function test of oral valve

4. Test at beginning of every season:

    a. Automatic inflation
    b. Manual inflation
    c. Oral inflation

[1] Owner's manual for Model 1339 and 1341 Type V PFD by Coleman Company, Inc.

APPENDIX I
FIGURES

FIGURE 1: AIR MONITORING LOGIC

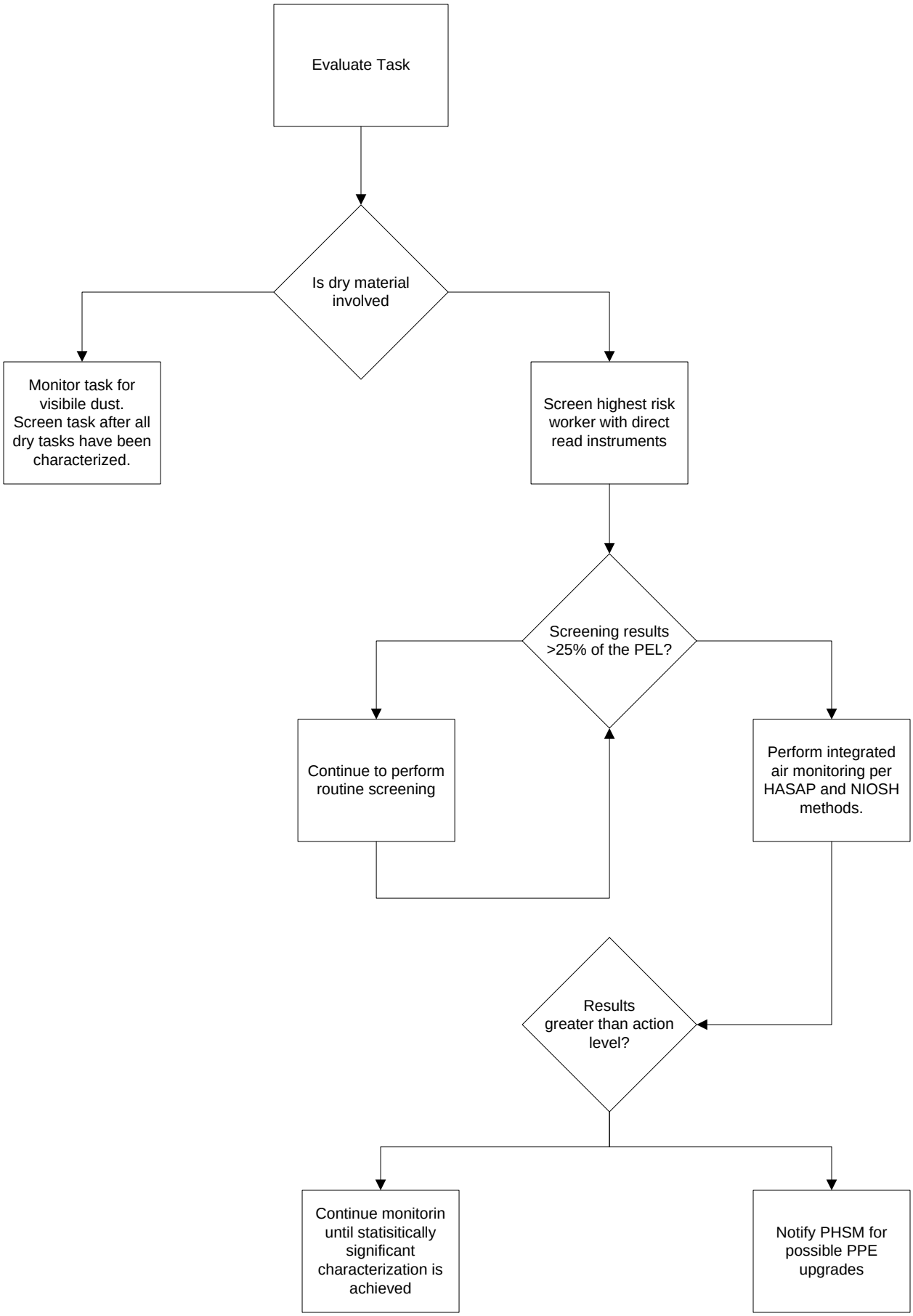


FIGURE 2: SITE ZONES

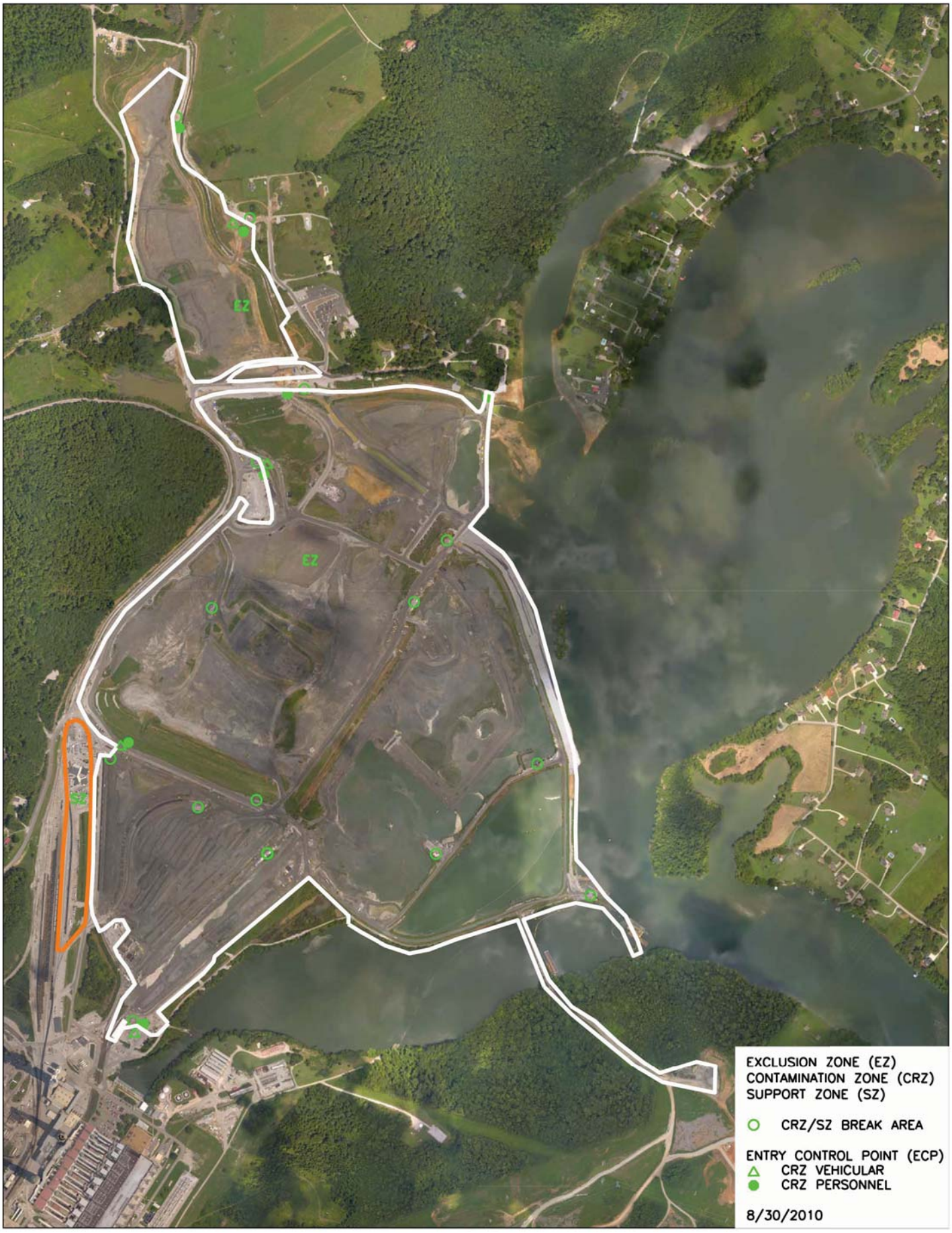


FIGURE 3: TYPICAL WORK AREA LAYOUT

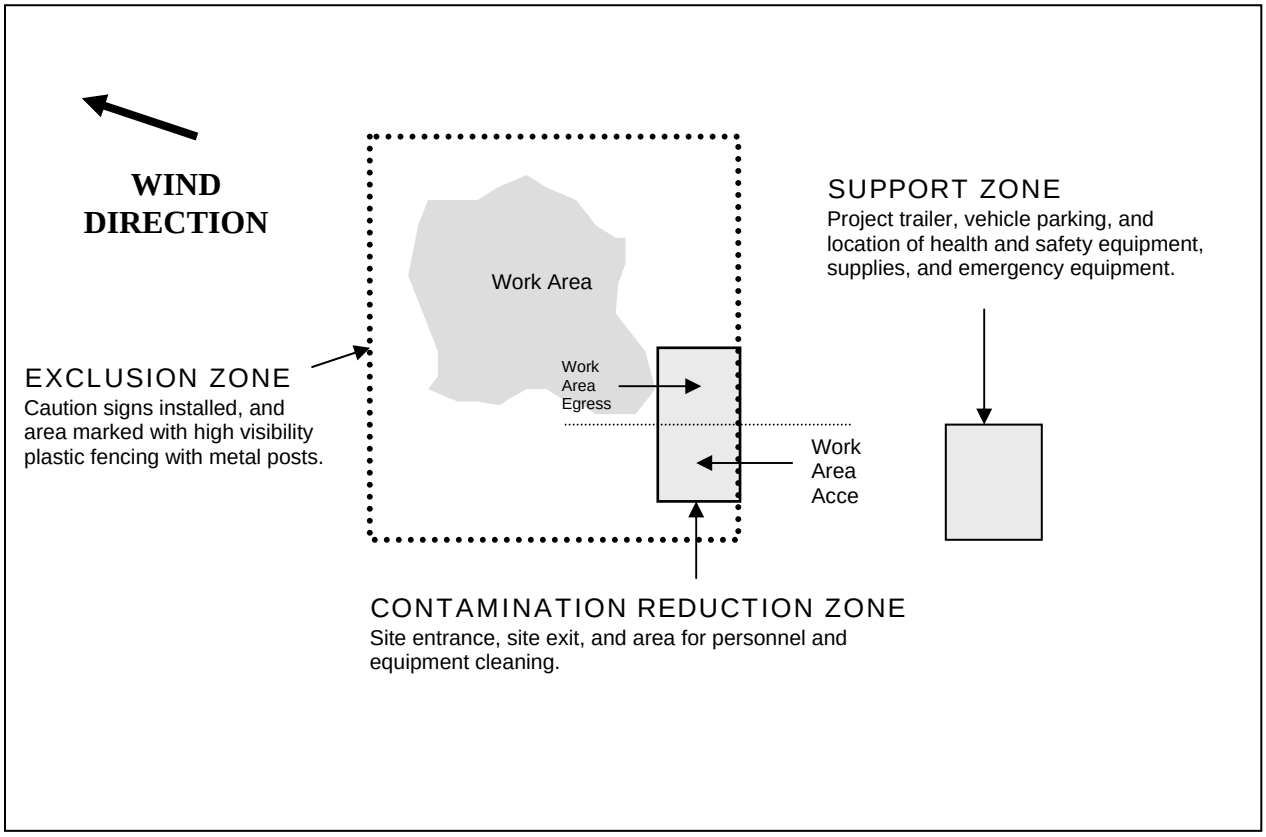
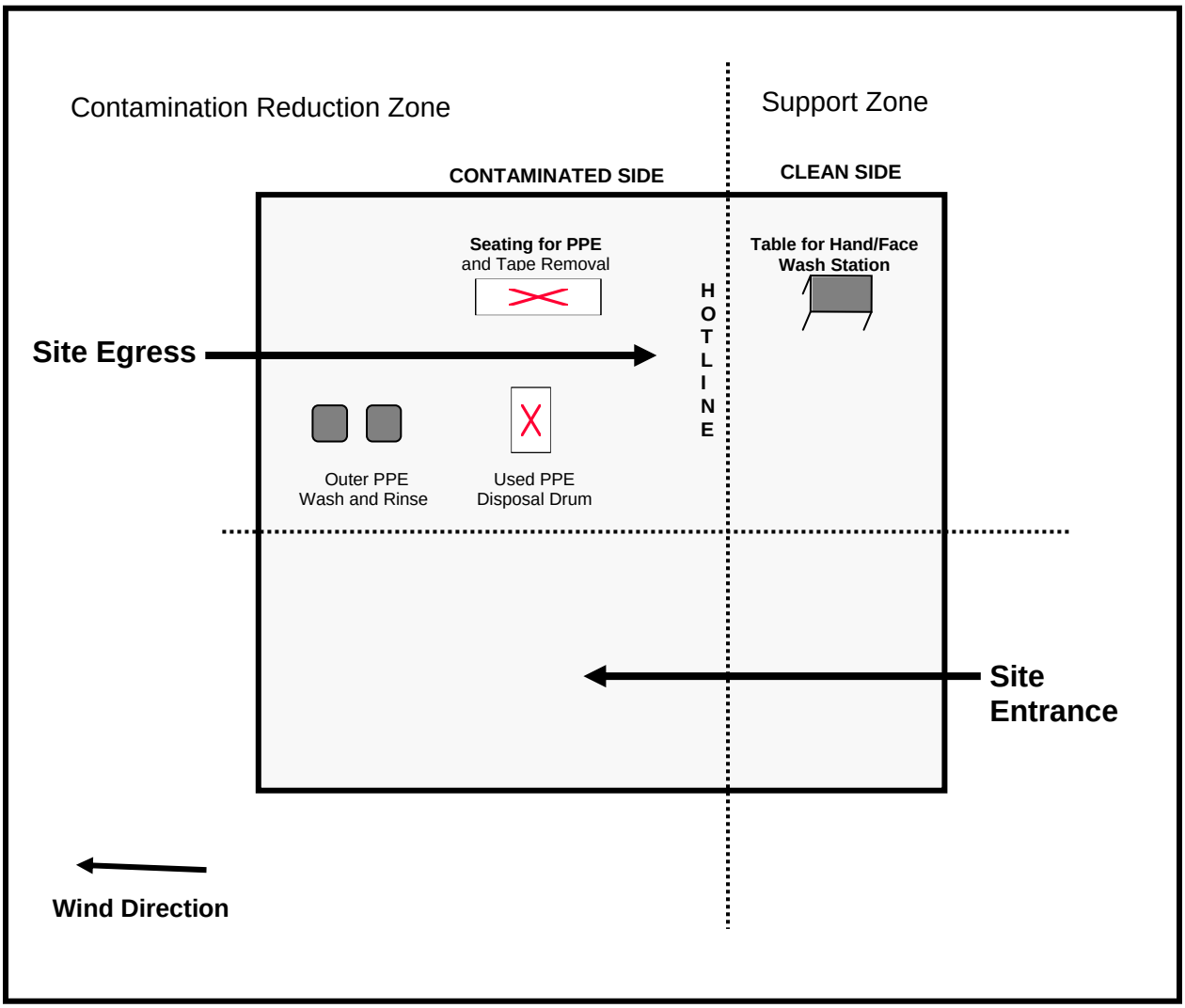


FIGURE 4: TYPICAL DECONTAMINATION AREA LAYOUT



APPENDIX J
RESPONSE TO EPA COMMENTS

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak HASP Comments, 6/1/09	1. Should have Daily Safety meeting between Gulf Strike Team and Jacobs/RSI staff. Include contractor safety representatives if possible or as needed (can follow staff meeting or in field).	Additional daily meetings are not recommended, safety is discussed in the daily 1600 meeting and at the 1630 staff meeting as necessary. In addition, the Jacobs site HSE staff interacts with the contractor HSE staff in the field on a daily basis. The GST representatives are welcome to join the Jacobs HSE staff during field visits as necessary. If the GST representatives require assistance or have specific concerns, they are welcome to discuss them with the onsite HSE Manager (Sean Healey) at any time.
B. Kovak HASP Comments, 6/1/09	2. Need additional safety officers assigned in the field for observing specific operations—other than dredging, driving, etc. Can the samplers be used for this as ASO's? Possibly another GST?	Supervisors and foremen are directly responsible for implementing the HSE requirements onsite for their work activities. Support and oversight is provided by the onsite HSE staff. Starting June 15, the staffing will consist of 5 HSE professionals during day shift and one HSE professional during night shift. These 5 plus 2 GST personnel is sufficient coverage.
B. Kovak HASP Comments, 6/1/09	3. Training programs – boat safety? On hour course on-line? Documented?	Will add boat safety training as a requirement for "novice" boaters required to operate boats on the river.
B. Kovak HASP Comments, 6/1/09	4. Personal hygiene – showers? Where located? Who for?	Showers are not currently required. In the event air monitoring indicates the need for end of shift showering, details will be added to the SWSHP and facilities will be obtained as necessary.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak HASP Comments, 6/1/09	5. Medical monitoring – where located? Who included?	Medical monitoring is not currently required. If air monitoring indicates the need for physicals, it will be the responsibility of each contractor to obtain providers to perform medical examinations at the clinic of their choosing per the requirements of their companies and 29 CFR 1910.120. During various pre-bid meetings with contractors this was discussed and it was recommended to the subcontractors that although it is not currently a requirement, it is a best practice to provide medical monitoring for their personnel.
B. Kovak HASP Comments, 6/1/09	6. Vehicles – wheel wash.	Discussed in Section 8 and locations identified in Appendix I. Further details are provided in the dust control plan.
B. Kovak HASP Comments, 6/1/09	7. Page 42 – decon personnel needing medical attention first.	Added to Section 8.4.
B. Kovak HASP Comments, 6/1/09	8. TVA safety procedures – referenced in HASP, where located?	Available on the TVA LAN homepage as a PDF document.
B. Kovak HASP Comments, 6/1/09	9. Navigation changes to river – USCG approved?	Any navigation changes to the river will be coordinated with appropriate state and federal agencies including the USCG.
B. Kovak HASP Comments, 6/1/09	10. Decon – Table 8-1, should address respirator cartridges and coveralls.	It already addresses this for Levels C and B decontamination procedures. There are no respirators or coveralls required for Level D PPE.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak HASP Comments, 6/1/09	11. Coordinate decontamination during medical emergencies in advance with EMS and local hospitals to see their policies.	Routine pre-response coordination will be done with all of the local agencies including the fire department, hospitals, and police.
B. Kovak HASP Comments, 6/1/09	12. Zones should be better defined – exclusion, CRZ, etc.	The definition of exclusion zone, contamination reduction zone, and support zone are clearly defined in Section 8.0.
B. Kovak HASP Comments, 6/1/09	13. JSA's (7.2) superintendent or foreman prepare these? Assistance from safety staff.	Yes as noted in Section 7.2.
B. Kovak HASP Comments, 6/1/09	14. Emergency drills — annually? Should be monthly or quarterly and check air horns.	Changed to quarterly in ERCP Section 11.
B. Kovak HASP Comments, 6/1/09	15. Need to address driving in HASP and boat operations.	Vehicle operation addressed in Section 4.1.9. Boat operation addressed in Section 4.1.5. Appendix H is dedicated to on-water and boat operations.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	1. Should formalize the safety role of the NSafe staff. Currently performing informal safety function.	Since December, EnSafe has been providing industrial hygiene monitoring and general HSE support at the direction of TVA. A transition to reporting directly to the Jacobs HSE Manager is underway.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	2. Develop an organizational chart for safety listing personnel and roles. Jacobs staff works close with safety function (3-4 staff assigned).	A Jacobs specific version of this is in the Project Execution Plan. A multi agency compilation of the various org charts onsite was completed by B. Poley, USCG.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	3. Daily Meetings are at 4 pm to review status of operations for the day. A next day planning meeting will be held following that meeting (4:30 pm?) for Jacobs Project Managers. Tom or Kirk (safety) will attend 4:30 pm meeting and then meet with GST to discuss safety.	Additional daily meetings are not recommended, safety is discussed in the daily 1600 meeting and at the 1630 staff meeting as necessary. In addition, the Jacobs site HSE staff interacts with the contractor HSE staff in the field on a daily basis. The GST representatives are welcome to join the Jacobs HSE staff during field visits as necessary. If the GST representatives require assistance or have specific concerns, they are welcome to discuss them with the onsite HSE Manager (Sean Healey) at any time.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	4. SWS conducting the HAZWOPER training off-site. Respiratory protection training is part of the 40 hour training but respiratory clearance, fit test not being done yet.	Approximately 200 personnel are attending offsite training. If respiratory protection is required, fit testing and site specific respiratory protection training will be conducted per 29 CFR 1910.134 for those needing to wear respirators and possessing proper medical clearance to do so. This will not be provided to the general site population.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	5. Plans being finalized on medical monitoring not started yet. Should add to HASP.	Medical monitoring is not currently required. If air monitoring indicates the need for physicals, it will be the responsibility of each contractor to obtain providers to perform medical examinations at the clinic of their choosing per the requirements of their companies and 29 CFR 1910.120. During various pre-bid meetings with contractors this was discussed and it was recommended to the contractors that although it is not currently a requirement, it is a best practice to provide medical monitoring for their personnel.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	6. Training records being collected and maintained on-site for all contractors.	No comment required.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	7. Proposed setting up mini CRZ's inside large EZ areas to allow for breaks of workers without coming all the way out of EZ. Will include decon and air monitoring. Need to work out logistics in advance.	This is already established in the SWSHP, general locations are identified in Appendix I.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	8. TVA safety program documents referenced in HASP will be accessible on site (currently just on-line). Will ID location in HASP and safety orientation.	The TVA HSE procedures are approximately 1800 pages long and will not be maintained in hard copy onsite because the hard copy document would not be considered a controlled copy. They are readily accessible on the TVA LAN and HSE office computer hard drives.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	9. Off-site operations such as cenosphere recovery is occurring 20 miles or so downstream. They develop separate ER plan for this operation and not included in HASP. Should add this operation as an appendix to HASP.	Task specific emergency response procedures are developed and discussed in the associated JSA for those types of tasks. This approach prevents having multiple ERCPs for one site.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	10. Need to coordinate/drill with TVA plant paramedics(Advantage) for medical emergency. May need to locate and AED at trailers or out on-site.	Agreed on the drill, the AED is located with paramedics.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	11. Need to run evacuation drills and test air horns and fine tune fire/evacuation plan. HASP will be revised and consolidated when finalized and workers will read and sign off.	Actual responses and drills are evaluated during and after these types of events. Best practices noted during the response / drill is documented on form, "Emergency Response Best Practice". As needed, changes are and will be made to the Site Emergency Response and Contingency Plan. Workers do not read, nor "sign-off" on the Site Wide Health and Safety Plan. Currently site specific orientation is provided to all site personnel. The orientation is derived from the SWSHP. Attendance at orientation is documented for each person.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	12. HASP will be revised and consolidated when finalized and workers will read and sign off.	This is an ongoing process.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	13. Safety orientation will include reference to HASP requirements.	The safety orientation material comes directly from the SWSHP.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	1. Page 4-3 Working on or near water- use 6' rule unless otherwise posted.	Added comment to section.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	2. Biological hazards- list & emphasize local/regional hazards.	These are already listed in Section 4.3 – Biological Hazards.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	3. Page 6-2 Specify long-sleeve coveralls/shirt.	Long sleeve shirts are not a requirement on the site.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	4. Page 8-1, 5, 6 Need to address "break zones" procedures- decon, what activities are permitted (smoking, eating, etc?), air monitoring?	Changed terminology from break area to support zone.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	5. Page I-3 Should have a better diagram of zones. Consider reducing the number of "break zones" and locate in lowest-risk areas.	Break areas will be operationally based and are associated with the type of tasks being performed and the equipment involved. The number may decrease if conditions warrant. The break areas will be maintained in a manner that is consistent with the requirements of a support zone. If work area conditions prevent this from being feasible, the break areas will be relocated as necessary.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	6. Page 8-4 If you don't address Level B dress out in section 6-2, don't address B decon.	Level B column removed.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	7. Page 15-1 Ensure that contractor reps turn in tailgate sign-in sheets & other applicable paperwork (JSA copies?) every Monday.	That is already specified in Section 15.2 – Weekly Reports.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	8. Page 15-5 Excavation permit = zero tolerance. Other permit requirements?	Permit requirements are established in the associated sections in section 4 of the SWSHP. For example, Section 4.1.6 discusses utility clearance permits, 4.1.11 discusses lift permits, 4.1.16 discusses hot work permits.

RESPONSE TO EPA COMMENTS

Document: Site Wide Safety & Health Plan
Comment Responder: S. Healey, Jacobs, 6/18/09

COMMENT SOURCE	COMMENT	RESPONSE TO COMMENT
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	9. Appendix B & E Should address major known ops- diving, boat operations, sampling & monitoring, construction, dike reinforcement. PPE=PFD/life jacket for water ops.	AHAs were developed for major known recovery operations relating to the recovery of the ash. Numerous ancillary tasks exist, AHAs and / or JSAs are developed for those as needed. The same is true for the health hazard evaluation process.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	10. Page C-9, 26 Cartridge change frequency- at least after each shift unless breathing resistance increases.	Every shift change-out is not required for the selected type of filter.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	11. F-7-1 List general pollution response equipment	Equipment had already been identified in Table 7-1.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	12. F-10-8 Should reference oil discharges and hazardous substance releases (terminology change).	Chemical release is a broader term since not all potential releases fall into oil or hazardous substances. An example of this is Chevron Clarity Hydraulic Fluid.

APPENDIX K
INDUSTRIAL HYGIENE MONITORING PLAN

APPENDIX K

INDUSTRIAL HYGIENE MONITORING PLAN

SITE WIDE SAFETY AND HEALTH PLAN

For the

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

TABLE OF CONTENTS

LIST OF TABLES

ATTACHMENT

1.0 INTRODUCTION

1.1 BACKGROUND

This Industrial Hygiene Monitoring Plan (IHMP) has been developed as Appendix K to the TVA Kingston Fossil Plant (KIF) Site Wide Safety and Health Plan (SWSHP). The intent of this IHMP is to fully develop, discuss, and apply the monitoring strategy associated with relevant sections of the SWSHP. In the event the SWSHP is updated, this IHMP will be reviewed and updated as necessary.

The preliminary IHMP entitled "Kingston Fossil Plant Coal Ash Recovery Site Industrial Hygiene Monitoring Plan" was prepared by EnSafe Inc. and was submitted on January 21, 2009 as an amendment to the Ash Recovery Site Safety Plan. The purpose of the preliminary IHMP was to outline the EnSafe air monitoring activities during the project. This plan revises and updates the preliminary IHMP and any subsequent plans submitted in draft or final form by EnSafe. Portions of the EnSafe IHMP have been referenced and utilized within this document.

Industrial hygiene activities began on December 30, 2008 with air monitoring being performed for fly ash and its constituents. Standard methods commonly employed by TVA and EnSafe for evaluating exposures to fly ash constituents during fossil boiler outages or day-to-day production or maintenance activities were implemented during the early phase of the project.

1.2 GENERAL INDUSTRIAL HYGIENE OBJECTIVES

Evaluation and control of health related exposures on the Kingston Ash Recovery Project site are key to ensuring and maintaining the health of the site work force, particularly as the project duration creates the potential for chronic exposures to become relevant.

In addition to worker protection, a properly developed and executed Industrial Hygiene Program will provide a repository of historical information for future use.

The principal objectives of the plan are as follows:

- Identify specific responsibilities for site Health, Safety, and Environment (HSE) staff and operations management with regard to Industrial Hygiene Program support.
- Identify the various Similar Exposure Groups (SEG) to be monitored onsite with the intent of drawing group level conclusions with regard to health exposures and controls.
- Specify the target stressors (chemical, physical, biological) that will require routine monitoring for each SEG.
- Identify specific action levels to trigger mitigation or programmatic development activities. These may include field controls, work techniques, training, medical monitoring, or utilization of personal protective equipment.
- Document the monitoring protocols for the site including frequency, specific analytes to be monitored for, and the sample methods to be employed.
- Establish a means to create and distribute proper industrial hygiene documentation to TVA management, operational management, TVA contractors, and individual workers.

1.3 KEY INDUSTRIAL HYGIENE PERSONNEL AND RESPONSIBILITIES

General site safety and health responsibilities are established under Job Descriptions of the Kingston Ash Recovery Project Management Plan. This section is included as it specifically relates to executing the onsite Industrial Hygiene Program.

1.3.1 Jacobs Site HSE Manager

The HSE Manager will be the key liaison between TVA / Jacobs Engineering Group Inc., (Jacobs) management and those technical specialists performing industrial hygiene activities onsite. This includes providing summary and transmittal reports as necessary, briefings, development of site-wide guidance, and reporting in relation to industrial hygiene findings.

1.3.2 Jacobs Site Industrial Hygiene Lead Technologist

The Industrial Hygiene Lead Technologist will be responsible for:

- Executing the general monitoring strategy outlined in this plan.
- Keep the Jacobs Site HSE Manager appraised of findings on a daily basis.
- Consulting with Jacobs' Certified Industrial Hygienist (CIH) staff when difficulties or anomalous findings are identified.
- Maintaining and calibrating industrial hygiene equipment per manufacturer's requirements.
- Proper handling of samples including chain-of-custody (CoC).
- Completing exposure monitoring paperwork and field log books on a daily basis.
- Observing workers being monitored and documenting relevant information.
- Performs data evaluation, prepares reports, and issues sample notification letters.
- Providing recommendations for control strategies as related to occupational health exposures.
- Verifying the back-up Industrial Hygienist is properly trained and capable of executing associated duties in the absence of the Industrial Hygiene Lead.

1.3.3 Jacobs Industrial Hygiene Manager

Responsible for assisting in the development of this IHMP general industrial hygiene monitoring strategies, evaluation of exposures, and providing recommendations for control strategies when necessary.

1.3.4 Data Management and Quality Assurance Team

The onsite Data Management Team and Quality Assurance (QA) Team assist the Industrial Hygiene Program with respect to laboratory coordination, laboratory data management, data validation, quality assurance, and data storage in EQuIS® in accordance with Section 6.3 of this plan.

2.0 INDUSTRIAL HYGIENE PROCESS OVERVIEW

2.1 IDENTIFY SIMILAR EXPOSURE GROUPS

The collaboration of TVA Safety and Industrial Hygiene staff, EnSafe, and Jacobs have established SEGs for differing categories of employees with potentially or expected similar exposures from work conducted at the Kingston Ash Recovery Project site. Segregation into SEGs is a function primarily of equipment-specific positional assignments or site responsibilities. As sampling is performed, task assignments will be noted on sample notes and recorded in the sample records/database used, but may also be dependent on activities. In the event results are elevated, task level controls will be implemented for that task.

Table 2-1 contains a listing of SEGs presently identified for the Kingston Ash Recovery Project operations. As activities change or are added to the site, additional exposure groups may be added as necessary.

Table 2-1
Similar Exposure Groups Identified at Kingston Ash Recovery Project Site

Amphibious Excavator Operator	Mgmt / Admin
Articulated Dump Truck Operator	Misc.
Boat Laborer	Polymer
Boat Operator	Railcar Loading - Dozer
Dozer Operator	Railcar Loading - Excavator
Dredge Boat Operator	Railcar Loading - Liner
Dredge Shore Operator	Scraper Pan Operator
Dump Truck Operator	Security
Equipment Decontamination Detail	Shoreline Operator
Excavator Operator	Southern Shores
Filter Press	Track Dump Operator
Flagger	Vacuum Barge Operator
General Laborers	Vacuum Truck Operator
Grader Operator	Water Truck Operator
Lime Application/Mixing	

2.2 EVALUATE

Periodic monitoring and sampling schedules will be based on the severity of potential exposures to recognized health hazards and possibly other factors such as number of personnel exposed and frequency of task performances, etc. This will be periodically reviewed and sample priorities updated as warranted.

The Site Industrial Hygiene Lead Technologist, in collaboration with TVA and Jacobs CIH staff, will conduct a Health Hazard Analysis of existing and new SEGs identified on the site using Attachment K-1, Sample Health Hazard Evaluation by Exposure Group form. Table 2-2 will be used to initially evaluate the potential for exposures to exist. Existing data will be used to evaluate exposures based on SEGs. Where existing data is not available, an objective

exposure determination will be made which may include the use of calculations, direct read monitoring and integrated monitoring. This process will continue for each SEG and each recognized health hazard until adequate exposure characterization has been completed.

The qualitative exposure assessment captured by Table 2-2 includes an evaluation of potential chemical exposures via inhalation, ingestion, and dermal contact and/or absorption. The assessments also include the potential exposures to noise and radiation and other potential physical hazards. The predominant exposure determinants and events such as frequency, magnitude, and variability of exposure and tasks, route of exposure, potentials for acute or chronic exposures or frequently repeated tasks and exposures along with the adequacy and potential for failure of engineering and work practice controls are considered as a part of the qualitative exposure assessment.

As new processes and tasks are identified on the Kingston site, the potential hazards will be included in the new Activity Hazard Analysis (AHA), and subsequently, the new or redefined operations may be re-categorized depending on existing SEGs. However, the Jacobs CIH staff will determine new strategies, as appropriate, to evaluate new potential exposures. If the qualitative exposure assessment indicates a minor, or no risk of exposure, no further action is required.

2.3 DOCUMENT CONTROL, REPORTING, AND NOTIFICATION

Independent of routine reporting, electronic and paper files will be kept for project documentation purposes. This information will be properly controlled and handled via the project Document Control process and includes CoCs, raw and interpreted lab data, exposure calculations, copies of distributed reports, copy of field notes, copies of calibration records, and other information relevant to the Industrial Hygiene Program onsite. All records must be maintained by TVA and associated employers for a minimum of 30 years.

Various reports and notification activities will occur as a result of industrial hygiene activities at the site. The following is a summary of the reports and their frequency.

2.3.1 Worker Notification

Employees will be notified of the results of all sampling regardless of levels recorded. For personal exposure monitoring, this will generally consist of specific notification letters. Employee notification letters for TVA staff will be provided by Jacobs for distribution by TVA Safety staff. Jacobs will distribute letters to subcontracted personnel.

2.3.2 Site-Wide Notification

In the event results dictate the need to notify SEGs or the entire site, Jacobs will develop the notification announcement and distribute via email, postings, and other announcements as necessary.

2.3.3 Weekly Reporting

Relevant industrial hygiene field notes will be rolled up into the existing weekly HSE report and will include general discussion of industrial hygiene activities and any notable observations.

2.3.4 Monthly Reports

Formal monthly reports of industrial hygiene activities performed onsite include interpreted results summary, table of monthly and year to date sample results, general conclusions about exposure levels, and any identified areas of concern.

This report will be generated by the Jacobs Site Industrial Hygiene Lead Technologist and will be reviewed by the Jacobs Site HSE Manager and Jacobs Industrial Hygiene Manager prior to distribution. Due to the lag time in receiving lab results, the report will be issued no later than the end of the following month for the previous month (e.g., end of July for June results).

2.4 VERIFY UPPER CONFIDENCE LIMITS AND MANAGE FURTHER MONITORING

When integrated monitoring is performed, a statistically significant sample of workers will be selected for exposure monitoring per the direction of the Jacobs Industrial Hygiene Manager, recommended National Institute of Occupational Safety and Health (NIOSH) sample methods, and other recognized industry standards. Nearby areas or employees may be monitored if it is suspected there is a dispersed impact of the contaminants of concern, however, these personnel will not count toward the statistical significance of the task workers monitored.

An evaluation of all exposure groups will be performed to determine exposure potential for recognized stressors. If data gaps exist, additional monitoring will be performed until all SEGs have been adequately characterized. Once an exposure group is adequately characterized, Exposure Levels (ELs) will be statistically evaluated. If data sets are large enough, parametric statistics will be utilized using the 95th percentile Upper Confidence Limit (UCL). For small data sets, Bayesian statistics will be utilized to determine with 95% confidence which exposure bands (Per Table 2-2) the associated levels fall into. Applicable ELs will be those listed in Section 4 and Table 4-2 of the SWSHP or the most recent version of applicable Federal, State, or Occupational Safety and Health Administration (OSHA) regulations or the most recent edition of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values booklet.

Table 2-2
Summary of Exposure Monitoring Actions

If the UCL is	The Exposure is Deemed	Further Monitoring consists of
<10% of the EL	Insignificant	Verifying the process and exposure potential remain unchanged
>10% and <50% of the EL	Marginal	Quarterly integrated
>50% and <100% of the EL	Significant	Monthly integrated
>100%	Unacceptable	Routinely until controls have adequately lowered exposures

If an Action Level in Section 4 of the SWSHP is exceeded, notification will be made verbally in the daily planning meeting. A preliminary review and validation will be conducted by the Site Industrial Hygienist or the Jacobs CIH. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factor(s) to the exposure, with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review and validation, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be immediately brought to the attention of the TVA and Jacobs Program Managers.

3.0 IDENTIFICATION OF MONITORING NEEDS

The need to include personnel or areas in industrial hygiene monitoring programs will be based on a number of factors; however, they will be primarily based on assessing the potential exposures of routine field activities.

3.1 EXISTING PROCESS

Currently the recognized processes onsite include; dredging, river operations, ash removal from land-based release areas, ash removal from existing storage areas, ash processing in the Ball Field, ash load-out, site maintenance, equipment maintenance, field supervision, Skimmer Wall recovery, Skimmer Wall construction, offsite utility construction, and office activities. These processes may occur within a number of different scenarios or with different contractors; however, the relative occupational exposures and stressors are expected to be relatively consistent.

3.2 NEW PROCESS

In the event new activities are added, an evaluation will be conducted to determine if new SEGs are created from those activities. If new SEGs are added, they will be included for routine monitoring along with other SEGs. Monitoring priority will be based on potential for exposure.

3.3 WORKER COMPLAINTS

Worker complaints are to be taken seriously and will be given immediate attention for initial evaluation. Initial evaluation includes direct observation of the related tasks, reviews of existing data for similar sampling, utilization of direct read instruments, and, when appropriate, discussion with the individuals involved.

If it appears that worker complaints present valid or real potential exposures, those complaints will be addressed by conducting integrated monitoring as soon as practical.

3.4 MANAGEMENT REQUEST

Management requests will also be given priority for initial evaluation which will include direct observation of the related tasks, reviews of existing data for similar sampling, and when possible, utilization of direct read instruments.

If after initial evaluation no conclusions can be drawn about actual exposure levels, integrated monitoring will be conducted as soon as practical.

4.0 CHEMICAL HAZARD MONITORING METHODS

4.1 STRESSORS OF POTENTIAL CONCERN

Table 4-1 lists the potential chemical hazards currently identified for the site and the applicable NIOSH methods associated with the particular contaminate sampling and analytical methods.

Table 4-1
Recognized Sample Methods to be Utilized

Method Number	Stressors of Potential Concern	Sampling Media
NIOSH 0500	Particulates, Total	37mm MWMCE[2]
NIOSH 0600	Particulates, Respirable	37mm PVC[3]
NIOSH 7300	Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron Oxide, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Sodium, Thallium, Vanadium, Zinc Oxide	37mm MWMCE
NIOSH 7500	Silica, Amorphous; Silica, Quartz; Silica, Cristobalite; Silica, Tridymite	37mm PVC
Per CHP[1]	Radium-226, Radium-228, Thorium-228, Thorium-230, Thorium-232, Thorium-234, Uranium-234, Uranium-235, Uranium-238	37mm MWMCE
NA	Misc. indoor air quality concerns (Office Trailers)	Varies

Notes:
[1] Per CHP – as coordinated by Jacobs Certified Health Physicist
[2]MWMCE – matched weight mixed cellulose ester
[3]PVC – polyvinyl chloride

4.2 EVALUATION METHODS TO BE USED

Potential inhalation hazards to those Stressors of Potential Concern (SOPC) listed in Table 4-1 will be evaluated through proper sampling techniques and review.

To initially determine potential exposures, the Site Industrial Hygienist will first review prior documented data collected by TVA and EnSafe. An evaluation will be performed to determine if adequate characterization has been achieved for each SEG or if data gaps exist.

If data gaps appear to exist, an objective evaluation will be done utilizing when possible the following sequence:

1. Calculations or exposure modeling
2. Direct reading evaluations
3. Integrated monitoring techniques

If methods 1 or 2 provide information that, with conservative assumptions, can verify or “prove” no exposures, the evaluation will be properly documented and will stop at that point. If this cannot be achieved, integrated monitoring will be performed and data collected until adequate conclusions can be drawn.

All integrated monitoring will be performed using recognized industry methods, primarily NIOSH Sample and Analytical Methods. As a general rule, area or environmental samples will not be used to evaluate worker exposures as significant variability may exist between the stationary monitor and the mobile worker and their breathing zone. Area monitoring may be used to evaluate the general effectiveness of controls samples and the potential impact of downwind / off site receptors.

Field quality control will follow the NIOSH methods which typically require one field blank for every 10 primary personal or area samples submitted for laboratory analysis. Field blank media will be selected randomly from the same lot as primary sample media. Field blanks will accompany primary samples at all times onsite and during shipment to and from the laboratory.

4.3 FREQUENCY OF EXPOSURE MONITORING

Personnel identified by SEGs will be repeatedly monitored as needed to ensure potential inhalation hazards are controlled below Action Levels. Not all SEGs will be sampled with the same frequency, dependant on determining site factors, but all SEGs should be periodically re-evaluated. The actual sampling strategy for a specific day is determined or approved by the Site Industrial Hygiene Lead Technologist, project CIH, or designee.

Frequency of exposure monitoring will be based upon the exposure risk rating identified for a given SEG. Once an SEG has been adequately characterized based on the UCL for the data set, additional verification monitoring will be based on Table 2-2.

4.4 EXPOSURE LIMITS

4.4.1 Sequential Analysis

Based on the results of prior sampling, a sequential analysis approach for total particulate and metals samples has been adopted. Samples are collected and initially analyzed for total particulate. If total particulate concentrations are at or above 0.5 milligrams per cubic meter, additional analysis is conducted for arsenic and cadmium provided they have adequate sample volume to record concentrations low enough to be meaningful.

4.4.2 Action Levels

Action Levels for the site are typically not regulatory levels; however, several SOPCs have specific OSHA-defined Action Levels. If an OSHA Action Level does not exist, TVA generally uses one-half of the time-adjusted Permissible Exposure Level (PEL) (Brief and Scala Method). Applicable action levels will be those listed in Section 4 and Table 4.2 of the SWSHP.

TVA is a Federal entity and is therefore governed by Federal OSHA PEL's. In addition, there are several contracting partners onsite that are required to follow the Tennessee (TN)-OSHA PEL's. The PEL's that will be mandated for compliance will be most conservative of either TN or Federal OSHA.

The Threshold Limit Values, (TLV's) found in ACGIH and/or the Recommended Exposure Limits (RELs) found in NIOSH will be typically used as a lower level indicator to provide an early warning of potential exposure risks. These indications will provide an opportunity for initiating further reviews, performing an evaluation and implementing subsequent controls that will aid in

maintaining exposures as low as reasonably achievable and maintain them to less than the established Action Levels required by law under both TN and Federal OSHA.

4.4.3 Exceedances

If an Action Level is exceeded, a preliminary review will be conducted by the Site Industrial Hygiene Lead Technologist; if this individual is not available, it will be conducted by the project CIH, TVA, or Site Safety staff. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factors to the exposure with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be brought to the attention of the TVA Site Manager.

If a TLV or REL value is exceeded, the site IH team will investigate the result further to determine exceedance based on laboratory and sampling limitations or if actual exposure has occurred. If an actual TLV/REL exceedance has occurred, the occurrence shall be documented along with the means of how the exceedance was confirmed. This lower level indicator would then be discussed with the CIH for toxicology and risk determination.

5.0 PHYSICAL HAZARD MONITORING

5.1 NOISE

There is a potential for personnel to be exposed to noise levels above the OSHA allowable maximum 8-hour Time Weighted Average during normal field operations. The Site Industrial Hygienist will first review TVA and EnSafe documentation to determine the severity of each existing noise exposure data prior to conducting sound level measurements and personal noise dosimetry on individuals in each SEG. Based upon this review and assessment, priority measuring will be conducted for those SEGs having the greatest need. Not all SEGs will require the same level of support or measurement; however, all SEGs should have or will be evaluated.

All noise sampling instruments and field calibrators will be maintained within the most current calibration cycles.

5.2 THERMAL STRESS

Heat stress monitoring equipment will typically consist of area sampling devices capable of Wet Bulb Globe Temperature measurements. Environmental heat measurements should be made as close as possible to the specific work area where the worker is exposed. Please note that for some operations (e.g., heavy equipment operations), this may require sampling inside the cab of applicable equipment. Equipment with air-conditioned cabs will generally not be sampled. Heat stress measurement equipment must have been serviced per manufacturer's specifications.

5.3 INDUSTRIAL ERGONOMICS

Numerous activities onsite present ergonomic stress and strain and the potential for personnel to suffer acute and chronic soft tissue injuries. An initial evaluation will be done of the various SEGs to determine if they fall within low, medium, or high potential for ergonomic injury.

Formal industrial ergonomic evaluations will be done for all those SEGs deemed to be at high risk for ergonomic problems. Controls will be implemented as necessary to minimize the related stressors. Once controls are implemented, a follow-up evaluation will be performed to verify they adequately address the issues identified.

Those SEGs falling into medium or low-risk categories will be evaluated on an as needed basis, primarily based on worker complaints or management request.

5.4 OFFICE ERGONOMICS

Those personnel who predominantly work in an office environment (project controls, administrative personnel, IT support, communications personnel, data management, etc.) should perform an initial self assessment of their work station to verify proper ergonomic configuration. If issues are identified or require input of an industrial hygienist, work station evaluations will be performed. In either case, all self evaluations and ergonomic consultations will be recorded and maintained within the industrial hygiene project files.

5.5 FREQUENCY OF EXPOSURE MONITORING

Noise and ergonomic stressors will be evaluated until proper exposure characterization for each SEG can be established. Additional monitoring will be performed if the process is known to have changed in a manner that would increase the potential for exposure.

Thermal stress will be evaluated daily during periods of time where it is likely to create heat related conditions onsite and will remain consistent with the process outlined in Sections 5.3 and 5.4 of the SWSHP.

5.6 EXPOSURE LIMITS RECOGNIZED

Exposure limits and sources of limits vary significantly for associated physical hazards. The following breaks out recognized limits for likely physical hazards to be encountered onsite.

5.6.1 Noise

All exposure limits for noise will be based on 29 CFR 1910.95 – Occupational Noise Exposure. These limits are currently 90 dBA for an 8-hour exposure with an Action Level of 85 dBA for an 8 hour exposure. With extended work shifts frequently encountered onsite, PELs for noise will be adjusted using a 5 dB doubling rate and Table G-16 of 29 CFR 1910.95.

5.6.2 Heat Stress

Limits for heat stress are established in the SWSHP, Section 5.3, and follow TVA Safety Procedure 806 for heat stress control. It is generally recognized that the ACGIH limits established for heat stress are too conservative for acclimatized workers and on which will not be used to base work / rest cycles.

5.6.3 Ergonomics

Numerous standards exist for ergonomic control; however, none are considered regulatory. When ergonomic evaluations are conducted, results will be compared to recognized industry standards including NIOSH and the ACGIH.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 EQUIPMENT CALIBRATION

Sampling and calibration of pumps and dosimeters will be conducted in accordance with equipment manufacturer recommendations, or as stipulated in the applicable OSHA or NIOSH Method. Personal sampling pumps will be calibrated before and after each day's sampling per SOP-HSE-037 Industrial Hygiene Personal Air Monitoring Procedure.

6.2 LABORATORY QUALITY CONTROL

All samples submitted for laboratory analysis will be analyzed by a lab accredited by the American Industrial Hygiene Association (AIHA) or participate in the National Voluntary Lab Accreditation Program. The use of non-accredited labs may be necessary for unusual analytes (e.g., NORM); in this case, approval of a CIH is required prior to submittal. Laboratories will be required to adhere to the contractual QC requirements and will be subjected to audits by the QA Team.

6.3 DATA VALIDATION

Data validation will be performed on data from personal integrated monitoring samples. The laboratory quality control samples to be reviewed will include blanks, duplicates, lab control standards, and calibration verification standards. Sample completeness and field blank/field duplicate results will also be evaluated if available.

The purpose of the validation is to ensure that the reported data is usable for its intended purposes. Samples that are not within the acceptable criteria for parameters representing sample collection, handling and analysis criteria will be identified, from which assessments can be made of data usefulness. These criteria will be developed in conjunction with the selected laboratory using guidance from the laboratory accreditation body.

The laboratory will deliver sample data packages in parallel to both the project Industrial Hygiene Program and the project Data Management Team/QA Team. For the Industrial Hygiene Program the following information is required:

- Summary data package in PDF form
- An Electronic Data Deliverable (EDD) to be used for data import into the JEG industrial hygiene database

Upon receipt of the analytical laboratory data, the Industrial Hygiene Lead Technologist compiles individual reports and assesses measured values against OSHA and other applicable exposure limits. Calculations of the dataset may be performed through an industrial hygiene database, spreadsheet, or other methods to facilitate documentation of the review. The Industrial Hygiene Lead Technologist also reviews measured values for reasonability against known field conditions associated with the sample, measurements taken elsewhere the same day, or historical measurements for a particular work activity.

The QA Team and TVA will receive an EDD and a Level IV data package. Upon receipt of the analytical laboratory data, the QA Team validates the data and the Data Management Team stores the data in EQuIS® in accordance with the *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP) and the *Data*

Management Plan for the Tennessee Valley Authority Kingston Ash Recovery Project (TVA-KIF-DMP-001, 2009)

If questions arise during data validation by either party, immediate communication must be made via email between the IH Team and the QA and Data Management Teams in order to ensure appropriate and parallel re-assessment of data is performed from a QA perspective. If data are required to be resubmitted by the laboratory, revised data will be sent in parallel to both the Industrial Hygiene Program and the project Data Management Team/QA Team. All discrepancies will be reconciled prior to either dataset being considered final. Once both datasets are consistent, the data are considered final.

6.4 DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is a logical series of seven steps that guides investigators to a plan for industrial hygiene data. The process is both flexible and repetitive, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation. The DQO process establishes performance and acceptance criteria that drive the plan for collecting data of sufficient quality and quantity to support the goals of the industrial hygiene study(ies). The DQO process leads to efficient and effective expenditures of resources; consensus on the type, quality, and quantity of data needed to meet project goals; and full documentation of actions taken during project maturity.

The steps in the DQO process are as follows:

1. State the problem
2. Identify the goal(s) of the study
3. Identify information inputs
4. Define the study boundaries
5. Develop the analytic approach
6. Specify performance or acceptance criteria
7. Develop the plan for data acceptance

6.4.1 Problem Statement

On December 22, 2008, a coal ash release occurred at the KIF, allowing a large amount of coal ash to escape into the adjacent waters of the Emory River and surrounding land, releasing about 5.4 million cubic yards and covering about 300 acres.

The coal ash, a by-product of a coal-fired power plant, originates from coal burned in boilers for power production at the KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand, but trace amounts of arsenic, selenium, cadmium, boron, thallium, beryllium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

In an effort to move the coal ash to its original location or offsite by rail requires much heavy equipment capable of moving the ash. This equipment includes such items as excavators, dump trucks, dredges, scraper pans, etc. Therefore the activities require drivers, operators, and support laborers, or personnel that have the potential for exposures. Due to the potential inhalation hazards and the CERCLA designation, Hazardous Waste Operations and Emergency Response controls have been placed on the site.

6.4.2 Project Goals

The primary objectives for industrial hygiene monitoring are to:

- Provide continuing confirmation that KIF-related constituents have not negatively affected the Kingston Ash Recovery Project site personnel's health by either acute (or single) or chronic (or repeated) exposures.
- Provide respiratory exposure data sufficient to substantiate efforts to minimize risk of adverse exposures are in place and effective for all individuals spanning all SEGs.
- Evaluate the effectiveness of best management practices (e.g., dust control, respiratory protection, etc.) in preventing or mitigating respiratory occupational exposures.

6.4.3 Information Inputs

The information necessary to achieve the objectives includes the following:

- Reoccurring and scheduled industrial hygiene personal air monitoring.
- Analytical results of air monitoring for ash-related constituents.

6.4.4 Study Boundaries

Personal (industrial hygienic) air monitoring will be conducted on all SEGs:

- Identified as having a potential respiratory exposure to coal ash constituents.
- Supervisory requests of personnel having been evaluated by industrial hygiene staff and verified as having potential exposures.

6.4.5 Analytic Approach

Coal ash contains numerous constituents that have been linked to adverse health effects in human receptors. Specific constituents of interest include silica, arsenic, selenium, beryllium among others. Analysis should be conducted by laboratories operating in accordance with the standards set forth by AIHA. Analysis should also be conducted based upon the associated methods identified by NIOSH.

6.4.6 Performance or Acceptance Criteria

The null hypothesis for personal industrial hygiene air monitoring is: The percentage of coal ash constituents do not result in occupational respiratory health hazards to personnel working onsite. The alternative hypothesis is: The percentage of coal ash constituents result in occupational respiratory health hazards to personnel working onsite.

The null hypothesis for dust control is: Best Management Practices (BMPs) are completely adequate for controlling occupational exposures of ash-related contaminants during removal operations. The alternative hypothesis is: BMPs are not completely adequate for controlling occupational exposures of ash-related contaminants during removal operations.

6.4.7 Data Acceptance

Data acceptance is based on criteria established in Section 6.3.

6.5 QUALITY ASSURANCE / QUALITY CONTROL AND QUALITY ASSURANCE PROJECT PLAN (QAPP) CROSS WALK TABLES

Jacobs uses the NIOSH Analytical and Sampling Methods outlined in the *NIOSH Manual of Analytical Methods* (NMAM) to perform the air sampling conducted on the Kingston Ash Recovery Project site. NMAM is a collection of methods for sampling and analysis of contaminants in workplace air of workers who are occupationally exposed. These methods have been developed or adapted by NIOSH or its partners and have been evaluated according to established experimental protocols and performance criteria. NMAM also includes chapters on quality assurance, sampling, portable instrumentation, etc. The methods used as described below in Table 6-1 can be found on the Internet at: http://www.cdc.gov/niosh/docs/2003-154/

Table 6-1
OSHA / NIOSH Analytical and Sampling Methods and Site SOPs

Method/SOP Number	Method/Document Title
NIOSH 0500	Particulates not otherwise regulated, total 0500
NIOSH 0600	Particulates not otherwise regulated, respirable 0600
NIOSH 7300	Elements by ICP (nitric/perchloric acid ashing) 7300
NIOSH 7500	Silica, crystalline, by XRD (filter re-deposition) 7500
SOP-HSE-037	Industrial Hygiene Personal Air Monitoring Procedure

Table 6-2
Quality Assurance Project Plan Cross-Walk

QAPP Element	Location in SWSHP	Location in NIOSH Methods
Data Quality Objectives	Appendix K, 6.4 Data Quality Objectives	
Industrial Hygiene Program Design	Appendix K, Section 2.0, Industrial Hygiene Process	
Sampling Methods	Appendix K, Section 4.0, Chemical Hazard Monitoring Method; Section 2.1, Identification of Similar Exposure Groups; Table 2-1, Similar Exposure Groups Identified at the Kingston Ash Recovery Project Site	Applicable NIOSH Methods (e.g., 0500, 0600, 7300, 7500, etc.)
Sample Collection	SOP-HSE-037, Industrial Hygiene Personal Air Monitoring Procedure	
Data Review and Validation (QAPP Section 21.0 22.0)	Appendix F, Appendix K, Section 6.3, Data Validation	
Assessments and Response Actions (QAPP)	Appendix K, Section 2.4 Verify Upper Confidence Limits and Manage Further Monitoring; and Section 2.3 Document Control, Reporting, and Notification.	

ATTACHMENT K-1

Sample Health Hazard Evaluation by Exposure Group form

HEALTH HAZARD EVALUATION BY EXPOSURE GROUP							
Work Area:							
Exposure Group:							
Task(s):							
Contaminant or Agent	**Exposure Probability**	**Health Effect Rating**	**Uncertainty Rating**	**Risk Rating**	**Month /Year to Monitor or Monitored**	**Applicable EL and Range of Results**	**Control Strategy Implemented**

Notes:

This table to be completed using the standard approach outlined in Jacobs *HSEP 12.1, Health Hazard Evaluation*
EL = Exposure Level